A STUDY

OF THE

TUMORS OF THE BLADDER

With Original Contributions and Drawings

BY

ALEX. W. STEIN, M.D.,

SURGEON TO CHARITY HOSPITAL, GENITO-URINARY AND VENEREAL DIVISION.
PROF. OF VISCERAL ANATOMY AND PHYSIOLOGY AT THE N. Y.
COLLEGE OF DENTISTRY, ETC., ETC.

NEW YORK
WILLIAM WOOD & COMPANY
27 GREAT JONES STREET
1881

H. O. A Industrial School,
Electrotypers and Printers,
189 E. 76th Street.

PREFACE.

FOUR cases of tumor of the bladder have come under my observation within a few years. Two of these were followed to their fatal termination. Both were instances of primary cancer; in one case the tumor was an encephaloid, in the other it was a villous epithelioma. Autopsies were fortunately obtained in both cases, the specimens were preserved and carefully examined microscopically by Carl Heitzmann, M.D., to whom also I am indebted for the drawings which accompany the histories of the cases herein recorded. The other two cases, both male, were only temporarily under observation; in one, the diagnosis was clearly made by physical examination and then the patient disappeared; in the other, the tumor was not made out by the touch, but the frequent micturition, blood-tinged urine, extreme tenderness of a certain portion of the bladder to the contact of instruments, together with the occasional escape with the urine of flocculent fleshy particles, left little doubt as to the existence of a vesical growth. With this personal experience I began an inquiry as to the exact status of the literature upon tumors of the bladder. Although our subject required considerable research, having to seek chiefly in medical journals

for the information desired, the field explored proved full of interest and replete with valuable information. I have endeavored to make this monograph as complete as possible in every practical detail bearing on the nature, symptomatology, diagnosis, and treatment of the disease of which it treats, and trust that it may prove of some value as a contribution to the surgery of the bladder.

ALEX. W. STEIN.

30 West Fifteenth Street,
Nov., 1881.

CONTENTS.

DURATION AND PROGNOSIS.

TREATMENT.

ILLUSTRATIONS.

BIBLIOGRAPHY.

1747. Warner. Polypus. Cases in Surgery, 4th edition, 1784; and Philosophical Transactions, 1790.
1797. Baillie. Polypus. Morbid Anatomy.
1800. Walter. Polypus. Medico-Chir. Trans., vol. 41.
1817. Langstaff. Cancer. Medico-Chir. Trans., vol. 8.
1822. Bingham. Cancer. Diseases of Bladder.
1823. Le Cat. Fungus. Howship, Urinary Organs.
1830. Dessault. Polypus, Villous. Chopart, Maladies des Vois Urinaires, 2 vols.
1834. Pleininger. Papilloma. Würtemberg Med. Corr. Blatt, No. 23.
Civiale. Gaz. de Méd., Paris, No. 52.
1835. Crosse. Polypi. Formation, etc., Urinary Calculi.
1836. Springall. Villous. Guy's Hosp. Rep., series 1, vol. 1.
1838. Hutchison. Fungoid. Med.-Chir. Rev., vol. vi.
Willis. Pendulous Growth. Urinary Diseases, London.
1839. Langstaff. Fungus. Med.-Chir. Rev., vol. iii.
Mendalgo. Cancer. Giornal di Venezia, Maggio, Junio.
1842. Barlow. Fungus. Guy's Hosp. Rep., series 1, vol. vii.
Warner, by Douglass. Villous. Lon. Med. Gaz., February.
Douglass. Tumor. " " " "
Howship, by Douglass. " " " "
Civiale. Maladies des Org. Genito-Urinaires.
1843. Contini. Cancer. Annal. Med. Chir. del Metaxa, vol. 9.
1845. Theinemann. Polypus. Amer. Journ. Med. Sc., July.
Vache. Polypi. L'Experience, No. 327, October.
1846. Bulley. Fungus. London Times, August 1st.
1847. Bentley, for Kingdon. Carcinoma. Trans. Path. Soc., London, vol. 1.

1847. Hiltscher. Carcinoma. Oest. Med. Wochensch., No. 46.
1849. Kestevan. Fungoid. London Med. Gaz., November.
1851. Beith. Cancer. Trans. Path. Soc., London, vol. iii.
Holthouse. Fungus. " " " " March 18th.
1852. Stanley, by Savory. Polypus. London Times and Gaz., July 31st.
1854. Gibbon. Cancer. Trans. Path. Soc., London, vol. v., series 2.
Shaw. Villous. " " " " " " " "
Holt. Cancer. " " " " " " " "
Thompson. Cancer. " " " " " " " "
Hutchinson. " " " " " " " " "
" " " " " " " " " "
Ohm. Tumor. Deutsche Klin., 24.
1855. Pollock. Cancer. Trans. Path. Soc., vol. 6.
Gibb. " " " " " 6.
1856. Sibley. Villous. " " " " 7.
1857. Stewart, by Hutchinson. Villous. London Times and Gaz., May 2d.
Lloyd, by Hutchinson. Tumor. London Times and Gaz., May 2d.
Cock, by Wilkes. Villous. Lon. Times and Gaz., May 9th.
Partridge. " " " " " " 2d.
Hooper. " " " " " " " "
Thompson. " Trans. Path. Soc., London, vol. 8.
Ellis. Cancer. Boston Med. and Surg. Journ., January 22d.
Jackson. " " " " " " " 29th.
1858. Lambl. Villous Cancer. Virchow's Arch., Bd. xv.
1859. Paulus. Cancer. Zeitschr. f. Chir. u. Geburtsh., xi., 14, p. 264.
1860. Coulson. Cancer. London Lancet, August 25th.
Clarke. " London Times and Gaz., August 18th.
Bryant, by Hicks. Villous. Trans. Path. Soc., London, vol. xi.
Senftleben. Sarcoma. Arch. f. Klin. Chir., Bd. 1, Heft 1.
Watson. Villous Cancer. Edinb. Med. Journ., June.
Hilton. Polypi. J. Cooper Foster's Surgical Diseases of Children.
Gibb. Cancer. Trans. Path. Soc., London, vol. xi.

1862. Bernadet. Fungus. Bull. de la Soc. Anat., April.
O'Connor. Cancer. Trans. Path. Soc., London, vol. xiii.
Heath. " " " " " " "
1863. Brown. Villous Cancer. Edinb. Med. Journ., May.
Sage. Cancer. British Med. Journ., February 7th.
Rankin. Epithelioid. British Med. Journ., August 22d.
Holmes. " Trans. Path. Soc., London, vol. xiv.
1864. Holmes Coote. Cancer. Med.-Chir. Trans., vol. 47.
Nash. Villous. British Med. Journ., March 26th.
Sanders. Cancer. Edinb. Med. Journ., September.
1865. Potain. Polypus. Gaz. des Hôp., No. 15.
1867. Ramskill. Growth. British Med. Journ., June 1st.
Bastian. Scirrhus. Trans. Path. Soc., London, vol. 18.
Thompson. Villous. " " " " " "
" Cancer. " " " " " "
Fleming. " Genito-Urinary Diseases.
" Polypus. " " "
" Encephaloid. " " "
1868. Hicks. Tumor. London Lancet, May 30th.
Guersant. Polypus. Gaz. des Hôp., No. 23.
Nunn. Villous Epithelioma. Trans. Path. Soc., London, vol. 19.
Birkett. Polypi. Med.-Chir. Trans., vol. 41.
Hewitt. " " " " " "
Cooper. " " " " " "
Petit. " " " " " "
1869. Heilborn. Krebs. Inaug. Diss., Berlin.
Dickenson. Cancer. Trans. Path. Soc., London, vol. 20.
1870. Reeves. Polypus. Boston Med. and Surg. Journ., August 25th.
Anderson. Cancer. British Med. Journ., January 22d.
Murchison. Villous. Trans. Path. Soc., London, vol. 21.
Thompson. Vascular Tumor. " " " " "
Jackson. Polypus. Boston Med. and Surg. Journ., August 25th.
1871. Faye. Fibro-myoma. Schmidt's Jahrb., Bd. 53.
Guillon. Polypi. Pitha-Billroth, allg. u. spec. Chir., Bd. 3, Abt. 2.

1872. Smyth. Cancer. British Med. Journ., July 20th.
Ashhurst. " Philadelphia Med. Times, April 15th.
Bishop. Polypus. Gross' Surg., Philadelphia.
Gersuny. Polypus. Arch. f. Klin. Chir., Bd. 13.
Galignani. Villous Cancer. Luglio. ann. univer., p. 127.
1873. Guilhaud. Cancer. Thèse sur l'anat. etc. de la Vessie, Paris.
1874. Marsh-Beck. Polypoid. Trans. Path. Soc., London, vol. xxv.
1875. Simon. Polypi. Arch. f. Klin. Chir., vol. 18.
Billroth. Myo-sarc. and Myo-carcin. Arch. f. Klin. Chir., vol. 18.
Wilkes. Villous. Wilkes and Moxon, Path. Anat.
Bryant. " Bryant's Surg.
Freund. Cancer. Virchow's Arch., Bd. 64.
Goetz. Cancer. Bull. de la Soc. Anat., Paris, November.
Herrgott. Tumor. Rev. Méd. de l'Est, September, p. 141.
1876. Mass. Polypi. Berlin. Klin. Wochenschr., No. 4.
Kocher. Papilloma. Centralbl. f. Chir., April 1st.
Volkmann. Myoma. Arch. f. Klin. Chir., Bd. ix.
Schatz. Fibro-myxoma. Arch. f. Gynäkol., Heft x.
Chambard. Cancer. Bull. de la Soc. Anat., November.
Boyer. " " " " " "
Poisson. Fungus. " " " " February.
Langlebert. " " " " " March.
" " 2d. " " " " "
Levertin. Cancer. Hygiea, 38, October.
" Fibroma. " December.
1877. Fagg. Epithelioma. Two cases. Trans. Path. Soc., London, vol. 28.
Butlin. Scirrhus. Trans. Path. Soc., London, vol. 28.
Winckel. Papilloma. Billroth's Handbuch Frauenkrank.
Brainwell. Cancer. London Med. Times and Gaz., December 22d.
1878. Alexander. Villous. London Lancet, August 17th.
Stimson. Sarcoma. New York Med. Record, November 26th.
Ultzmann. Villous. "Ueber Hematurie."

1878. Marchand. Sarcoma. Arch. f. Klin. Chir., Bd. xxii.
" Cancer. " " " " "
Harrison. Encephaloid. On Urinary Organs.
" Villous Cancer. " "
Avezon. Cancer. Bull. de la Soc. Anat., February.
Phillipart. " Presse Méd., xxx., No. 22.
1879. Humphry. Papilloma. Med.-Chir. Trans., vol. 62.
Norton. " Two cases, British Med. Journ., May 31st.
Heath. Villous Sarcoma. London Times and Gaz., December 13th.
Hudson. Polypi. Dublin Med Journ., June.
Morris. " British Med. Journ., May 31st.
Bryant. Growth. " " " " "
Godson. Polypus. " " " April 26th.
Brenneke. Fibro-myxoma. Arch. f. Gynäkol., April 12th.
Thornton. Sarcoma. British Med. Journ., May 31st.
Sänger. Secondary Sarcoma. Arch. f. Gynäkol., Bd. xvi.
Ahlfeld. " " " " " "
1880. Marcacci. Villous. London Medical Record, May 15th and December 15th.
Davies-Colley. Villous. London Lancet, December 18th.
Hicks. Cauliflower-like Mass. London Lancet, May 30th.
Soltmann. Secondary Sarcoma. Jahrb. f. Kinderhlkde., Bd. xvi., H. 3 and 4.
1881. Barton. Carc. Papilloma. Dublin Journ. Med. Sc., February.
Treves. Villous. London Lancet, April 30th.
Davies-Colley. Shaggy Epithelioma. London Lancet, April 30th.
Hill. Epithelioma. British Med. Journ., May 14th.
" Villous. " " " " "
Lancaster. Cancer. Coulson's Diseases of Bladder.
Coulson. " " " "
Belfield. Myoma. Wien. Med. Wochenschrift, May 19th.
Thomson. Myxoma. British Med. Journ., March 12th.
Stein. Villous Cancer.
" Encephaloid.

TUMORS OF THE BLADDER

TUMORS of the bladder may be classified as follows:

- Benign Growths.
  - Papillomata, or villous growths.
  - Myxomata, or mucous polypi.
  - Fibromata, or fibrous polypi.
  - Myomata.
- Malign't Growths.
  - Carcinomata.
    - Epithelioma, villous.
    - Encephaloid.
    - Scirrhus.
  - Sarcomata.

I have brought together and classified sixty cases of benign papillomatous, villous, and polypoid growths. In addition to these, I find casual mention made of a few cases said to have been recorded by the older writers (Lusitanus, Sylvius, Kirchner, Rolin, Collison), but of these I have no data. Again, our numbers might be still further increased by the addition of a few cases undoubtedly benign, but which, being simply designated as fungi, without further description as to structure, etc., could not be properly classified, and were excluded.

PAPILLOMATA, OR VILLOUS GROWTHS.

These tumors, as their name indicates, present usually the characters of a true villous structure, closely resembling the villi of the chorion. To be appreciated, they must be examined under water; when out of water, they collapse

into a comparatively small bulk, but placed in water, the villosities are floated out and present a beautiful and characteristic appearance: the larger villi branch out from the central mass, and from these smaller villi are seen sprouting out, and from these again still smaller ones often arise. The form of the villi is variable, some being thick and short, others long, club-shaped, and others still long and filamentous. In minute structure, each villous is composed of a capillary loop, covered by a scanty epithelial investment, which does not grow within the delicate framework of connective tissue (see Plate ii., Fig. 2).

There are several varieties of villous growths which vary in shape and appearance.

They may present as numerous villous processes without a distinct tumor, that is, the villi grow directly from the mucous membrane without any base. This was well shown in a case of Mr. Murchison; the base of the bladder and portion surrounding the orifice of the ureters was studded with numerous long, delicate, villous processes, nowhere forming a distinct tumor, and his case is further interesting in that on the mucous lining of the pelvis and calyces of both kidneys were also found numerous long villous processes. They were from one to several lines in length, covered externally with a thin layer of epithelium, and included a capillary vessel full of blood. Mucous lining of ureters was free from disease. Death was caused from uræmia due to obstruction of ureters by clots of blood derived from the villous processes above.

Some of these growths appear as pendulous tumors hanging from the mucous membrane by a distinct stalk, or pedicle, and terminate in numerous filamentous processes (see Plate i.). Others are sessile, and occur somewhat less frequently than the preceding variety. They may appear either as soft, loose, shaggy, villous tufts, projecting more or less from the mucous surface, or they may

have a more solid basis structure, and present a warty or cauliflower-like appearance.

Villous tumors of the bladder have long been regarded as malignant in their nature, principally, perhaps, on the authority of Rokitansky, who wrote an essay on this subject, an abstract of which can be found in Paget's lectures on Surgical Pathology, vol. 2. And while it cannot be denied that malignant growths do sometimes take on a villous character, or that simple villous growths may become malignant, examples of which we find both among carcinomata and sarcomata, such growths are rare. A careful study of the cases I have collated will show that villous growths are usually benign. In structure, they do not partake of the character of malignant tumors. In their origin and in the manner of their development, they are as innocent growths. The course and duration of the complaint is not in accordance with that generally observed in malignant disease. They are strictly local, do not invade adjacent tissues, there is no glandular involvement, and there are no secondary deposits occasioned in other organs of the body. They do not cause death from malignant cachexia, but from hemorrhage or from the consequences of mechanical obstruction to the outflow of urine. These facts are very evident after a careful study of the history, course, symptoms, and termination of many cases of villous disease on record.

I have collated thirty cases of papillomatous or villous growths. Sixteen occurred in the female and fourteen in the male, that is, the frequency of occurrence in the two sexes was about equal. With respect to age, the youngest subject was two and three-quarter years old, in two others the subjects were impubic. After that, however, none appeared before the age of thirty-two. Seventeen were between thirty-two and fifty years of age. The oldest patient was seventy. Villous growths are as often multiple as single; the two classes of cases were found in

just equal proportion. As many as twelve distinct tumors were found in one case, and in several the vesical walls were said to be studded with numerous villous growths. They are more frequently pedunculated than sessile. They are generally small, but vary in size from that of a pea to a goose egg, or a small orange; and in one of Simon's cases the papilloma filled two-thirds of the cavity of the bladder which he successfully removed by the scoop. They are very rarely situated on the anterior wall. Their usual point of attachment is the trigone and near the ureters; of the two openings, the right ureter by predilection.

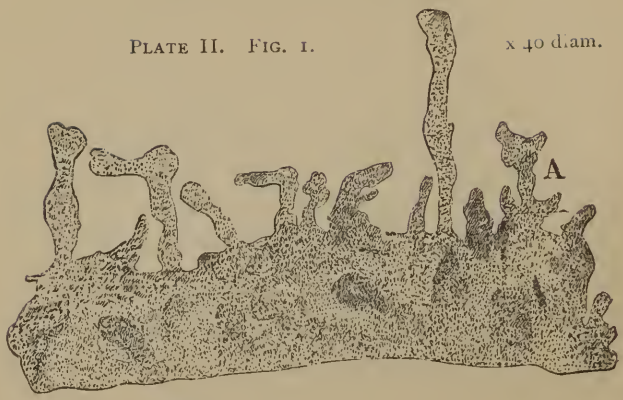
An interesting and typical case of benign villous growths is reported by Dr. R. S. Hudson in the *Dub. Journ. Med. Sc.*, June, 1879, from which our Plates i. and ii. are taken. The structural character of these simple tumors is here well shown, and may be examined in contrast with the microscopical appearances of villous epithelioma as shown in our original drawing (Plate viii.).

Plate i., Fig. 1. Bladder half original size. Dr. Hudson says, "It will be seen that there are eight tumors, each connected by a narrow pedicle, which might be ligatured, avulsed, or treated with the écraseur. The large tumor at the fundus has been reflected so as to show more distinctly the pedicle from which it springs. All were coated with a thick layer of phosphatic deposit like brownish mortar. When this layer was removed and a portion of the tumor floated out in water, its true character was seen: delicate, lace-like growths springing from a firm, fleshy pedicle. To the right will be seen the enlarged projecting bundles of an hypertrophied bladder not unlike the columnæ carneæ of the ventricles of the heart. The openings of the ureters may be seen, but the ureters themselves, owing to the obstructed flow of urine, were dilated to the size of the œsophagus."

Plate ii., Fig. 1 represents a portion of the tumor under an inch object-glass.

PLATE I.—Eight benign villous growths. Case of Dr. R. S. Hudson.—*Dublin Medical Journal.*

PLATE II. FIG. 1. x 40 diam.



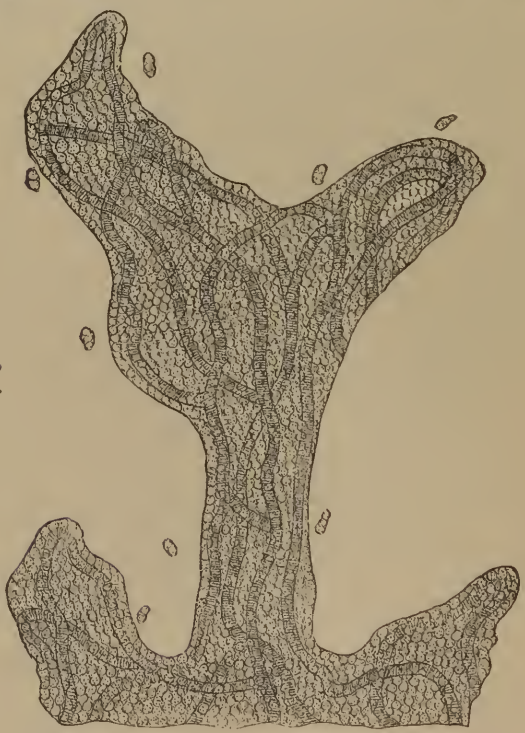


FIG. 2
(= A, Fig. 1,
x 310 diam.).

Microscopic appearances of Dr. Hudson's benign villous growths.—*Dublin Medical Journal.*

Fig. 2. A portion of the same under a quarter of an inch object-glass. "The thin-walled capillary vessels of irregular diameter may be seen coursing through the growth, the whole surface being covered with a columnar or polygonal epithelium. The epithelium is, however, *on* the surface, *homologous;* not *within* the subjacent connective tissue, *heterologous*, which is characteristic of epitheliomatous growths."

POLYPI.

The mucous polypus or benign myxoma is a soft, smooth, succulent, œdematous-looking, pediculated growth, resembling nasal polypus. It grows from the mucous surface, and is composed chiefly of the elements of that structure, with a stroma of loose connective or filamentous tissue. The structure of the fibrous polypus is indicated by its name; it is firmer and more fleshy or fibrous in consistence than the mucous polypus; has a reddish-blue or dark-red color, and proceeding from the submucous connective tissue, it pushes the mucous membrane before it. These tumors, mucous and fibrous, project into the interior of the bladder either as long pendulous bodies (Pl. iii.) or as globular, pyriform, or irregularly-shaped outgrowths.

Of the polypoid growths, mucous and fibrous, I have found thirty, which shows that these growths are not as rare, compared with the papillomata, as is generally believed; the two classes of growths appearing nearly in an equal number of cases. With respect to sex, our numbers are almost equally divided, sixteen being male and fourteen female. While polypi may occur in advanced life, one having presented at the age of seventy-three, they are generally found at an earlier period of life than any other kind of tumor. Especially is this true of mucous polypi which have occurred at the ages, respectively, of five, two, and two years; twenty-two, eighteen, and thirteen months. Winckel found two mucous polypi in the bladder

PLATE III.

Polypus, from Christopher Fleming's "Diseases of Genito-Urinary Organs."

of a female child who died thirty-six hours after birth; one was situated at the superior fundus (an exceptional position); was very vascular, soft, pediculated, semi-globular, and somewhat larger than a pea; the other, a smaller growth, came from the lower portion of the bladder.

Polypi are by far more frequently single than multiple. In size they vary from a nut to that of the fist. From Jackson's patient a piece was removed the length of the finger, and after two days, another piece, eight inches long and thick as the thumb, was twisted off. In their manner of attachment they are occasionally peculiar. In one instance (Stanley) the growth stretched transversely across the fundus, behind the aperture of the ureters, and was attached on either side, but free in the centre. In another (Thompson) there were two growths, each the size of a small fig, with a slender stalk, one and a half inches long, which joined to form a common pedicle connected with the trigone. In a third (Petit), a pyramidal-shaped tumor the size of the fist was attached by a very delicate pedicle. In still another (Thomson), the cavity of the bladder was almost obliterated by a myxoma. From the upper and right side of the cavity hung a mass resembling a bunch of Hamburg grapes. Like the papillomata in their point of attachment, they have a predilection for the trigone, and are probably found more frequently near the urethral orifice than the former.

Pure fibrous tumors are not common. Gersuny relates a very interesting case of vesical tumor in a man aged forty-nine, which he attempted to remove by perineal cystotomy, but failed. The man died, and at the bas-fond towards the right there was found projecting into the bladder a diverticulum with an inclosed tumor. A quite wide orifice communicated with the interior of the cyst, the edges of which being pushed back, a firm elastic tumor about the size of a hen's egg fell out. It was nearly globular, with a smooth surface, having, however, several

converging furrows leading to a point, from which originated a pedicle one and a half inches long, and not the diameter of a quill (Pl. iv., Fig. 2). The tumor which was attached to the interior of the diverticulum was torn off by very slight fraction. The vertex of the bladder was found to be in communication with a pus cavity above, and this again with another cavity containing a stone the size of a walnut, egg-shaped, weighing two drachms, and having for its nucleus the broken end of a catheter (Pl. iv., Fig. 1). A represents the abscess cavity, which communicates posteriorly with the bladder, V, and anteriorly with the cavity containing the stone, C. D shows the diverticulum, which projects with its contained tumor into the cavity of the bladder. At F is the opening into the diverticulum, through which a portion of the tumor is seen. The tumor consisted of undulating connective tissue and numerous spindle cells, with round nuclei. This patient had suffered with blennorrhœa for eight years, and gave history of having had retention of urine several times, the last time requiring supra-pubic puncture, which opening was not allowed to heal for three weeks. Some time after the puncture was made, one day, while catheterizing himself, an inch of the distal end of a flexible catheter broke off and remained lodged in the urethra, as he said, just behind the scrotum. Attempts to remove the same proved ineffectual. This case is remarkable: first, in the peculiar development of the tumor; second, in the formation of a diverticulum at the vertex of the bladder, occasioned, no doubt, by the supra-pubic puncture; and third, in the wandering of the catheter fragment into this cavity and forming the nucleus for a stone.

Somewhat analogous to the above, as regards the existence of an abscess cavity in connection with the bladder, is the case of Stanley. Here the growth was so situated as to fall over and obstruct the urethra in the act of micturition, and the urine being driven into the

PLATE IV. FIG. 1.

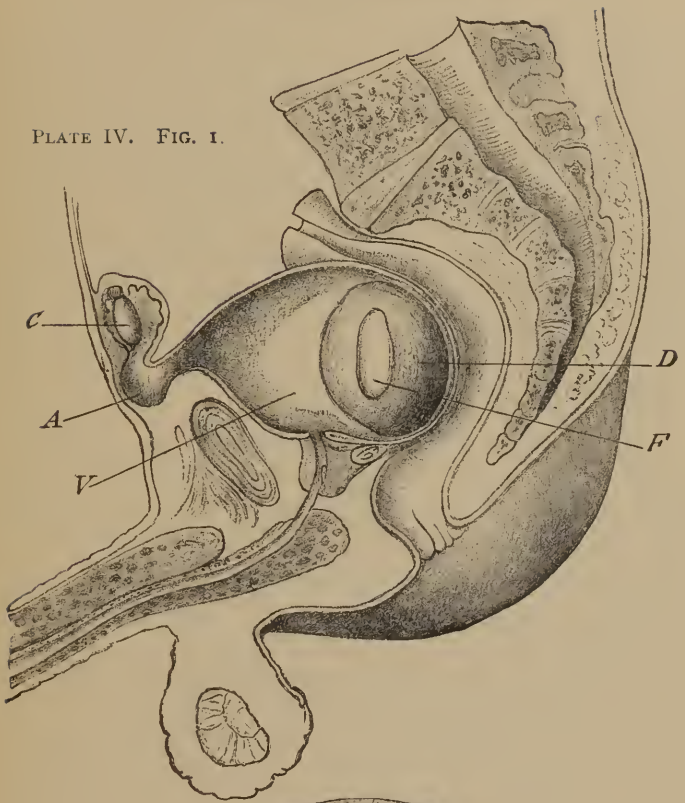
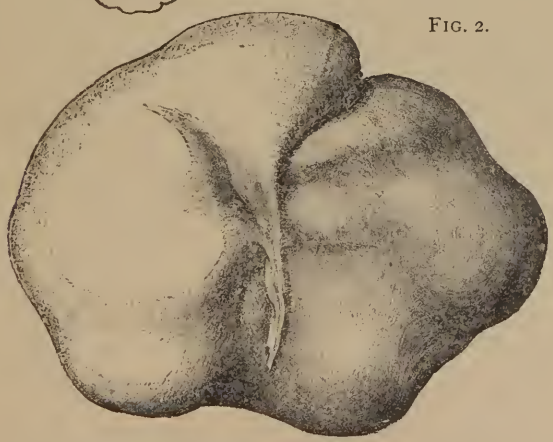


FIG. 2.



Fibrous polypus inclosed in a diverticulum.—Gersuny, *Arch. f. kl. Chir.*, Bd. 13.

imperfectly-closed orifice of the urachus, this tube was gradually reopened until the urine reached the vicinity of the umbilicus, where an abscess formed, which, being opened, gave exit to both pus and urine, and for a number of days before death all the urine was discharged through the opening in the abdominal wall. The patient was a male child, aged thirteen months.

Gersuny also mentions and gives the drawing of a cysto-fibroid, which was found post-mortem by Prof. Ernst in the bladder of a boy aged fifteen. The tumor was of the size of an apple, and attached by a thin pedicle to the fundus.

CARCINOMATA.

Cancer of the bladder may present under the forms of epithelioma, encephaloid, villous, and scirrhus, and, as I believe, in the order of frequency mentioned. Upon this matter, however, a very wide discrepancy of opinion prevails among writers. I need only refer to such eminent authorities as Gross and Coulson, who have most recently written on the subject. The former says: "The usual variety of carcinoma met with in the bladder is the epithelial; what was formerly known as scirrhus, is nothing more than the firm, infiltrating form of epithelioma. . . . The encephaloid form is of the same nature, but its stroma is more delicate and more vascular." On the other hand, Coulson says: "Encephaloid is the most usual form, scirrhus has occurred less frequently, and only a few cases of epithelioma have been placed on record." It is, unfortunately, impossible to reconcile these opposite statements. Our researches do not accord with the view expressed, "that only a few cases of epithelioma have been placed on record." On the contrary, it would seem that, taking vesical tumors collectively, epithelioma exists in at least a good percentage of cases. With regard to the propriety of designating the cancers as epithelial, encephaloid, and scirrhus, it may be

said that these terms have at least, clinically, not been abandoned, and if there is any foundation for such a classification, it applies for tumors of the bladder as well as for other parts of the body. This is shown by the variation vesical tumors present in regard to their mode of growth, histological characters, clinical history, etc. For example, descriptive of epithelioma, we have: 1st. One or more small, submucous, circumscribed nodules, or points of induration. In a primary cancer (Thompson), there were five or six masses, varying in size from a pea to a horse bean, and unconnected with each other. 2d. It may present as an ulcerated surface, with elevated and indurated edges. In Nunn's patient, there was a large, ragged ulcer, and only the anterior third of the walls of the bladder was free from epitheliomatous disease. In several of our cases, the epithelial, or so-called "bird's nest" aggregations, so characteristic of epithelioma, is distinctly mentioned, and with the exception, perhaps, of the enlargement of abdominal glands, there is in these cases no secondary deposition of cancerous material.

Corresponding to the encephaloid variety, we have the history of a more rapid disease, a decided tumor projecting into the interior of the bladder, often attaining an enormous size, with a soft sprouting, fungoid, or cauliflower-like appearance, and in structure composed of an abundance of cellular elements, with a scanty stroma. In some instances, the tumor was found broken down in fatty and caseous degeneration, and presented a dirty, ragged ulceration with fungating edges. In the patient of Sept. Gibbon, the tumor was the size of two fists, arising by an extended base from the anterior surface. At the posterior surface, the mucous membrane was studded with numerous wart-like medullary growths. Section of growth presented white, pulpy, pear-like appearance, except in the centre, which was softened and broken down, containing buff-colored, offensive pus.

Villous cancer is a form of epithelioma. It is a soft, spongy mass, projecting from the wall of the bladder, and having on its surface those peculiar vascular processes from which it derives its name. It differs from the benign villous growth, mainly in that the latter is limited to the mucous membrane, and its villous processes have but a scanty epithelial covering, through which the capillary loop within can be distinctly seen, while the villous cancer has a deeper origin in the connective tissue, constituting a thickening of the vesical walls, or forming a tumor which may be recognized by external palpation. Its villi have an abundant epithelial investment, by which the interior of its structure is obscured or rendered invisible ; but most prominently is its malignant nature manifest by the infiltration of its base and villi with closely-packed epithelial cells (see Plate viii.).

Scirrhus of the bladder is undoubtedly rare. Bastian and Butlin have each reported a case which they regard as typical of the disease. In the first patient, the base and anterior wall of the bladder were thickened and infilfiltrated with cancerous material. The mucous membrane was entire and healthy, though raised, and irregular on the surface. There was no distinct tumor. In the patient of Butlin, there was a uniform infiltration of all the coats of the bladder; its capacity was so much diminished that it could only hold an ounce of fluid ; and owing to the stiffness of its walls did not admit either of contraction or dilatation. Its mucous membrane was corrugated and inflamed. The bladder was very adherent to surrounding parts by extension of the disease, and could only be removed by free use of the knife. It had eaten deeply into the pelvic bone, on the right side, the body of which was, in great part, destroyed. Microscopic examination showed that the cancer was not only of the hard variety, but quite deserved the name of scirrhus. The cells were generally of smaller size, with much smaller nuclei than

usually occur in the medullary cancer of the bladder. The stroma consisted for the most part of very firm and abundant fibrous tissue. In both the above cases, secondary deposits were found in the abdominal glands, liver, kidneys, beneath the peritoneum, and beneath the parietal pleura.

Cancer of the bladder may be primary or secondary; that is, the malignant growth may originate directly in the tissues of the bladder, or this viscus may become involved by extension of the disease from neighboring parts.

As a primary affection, cancer of the bladder is not common. As secondary to the disease in the female sexual organs, prostate, rectum, etc., literature affords an ample number of cases. Out of 4,777 autopsies (3,043 male, and 1,734 female) recorded at the Pathological Institute of Berlin, from 1859 to 1868, Max Hilborn found 37 cases of cancer, of which 33 occurred in women, and four in men. Out of the 37 cases, the disease was secondary in 30, primary in 7. In 29 of the secondary cases, the extension occurred from the uterus, and in one from the rectum. Of the 7 primary cases, 4 occurred in women, 3 in men. As among the 4,777 subjects, 3,043 were male, and 1,734 female, the vesical cancer occurred 15 times oftener in women than in men; but the percentage of primary cancer was 12% against 75% in men.

According to Winckel, out of 2,505 autopsies of women made at the Dresden Krankenhaus, there were 73 vesical cancers. That is a percentage of nearly 30 against 20 recorded in Berlin.

Secondary cancer is infinitely more common than primary. It is much more common in women than in men, while primary cancer seems to be more frequent in men than in women.

Secondary cancer of the bladder in women is almost without exception an extension of the disease from its favorite seat, the pars cervicalis uteri. The frequency of

cancer of the uterus and the portio vaginalis uteri with its tendency to spread towards the bladder accounts for the frequency of vesical cancer in the female.

In men, as a secondary disease, cancer is generally an extension from the prostate, rectum, or vesiculæ seminales.

That epithelioma is the most common variety of cancer found in the bladder must be inferred from its greatest frequency in women as a secondary affection from the uterus, for which organ epithelioma has so great a predilection. But this is true, not only for the secondary cases, but also for the primary. Indeed, it is exceptional to find other than epithelial or villous cancers originating in the walls of the bladder. As has been said, they occur more frequently in men than in women. In at least sixteen of our cases the primary origin of the cancer in the bladder cannot be doubted, though I have been circumspect in my selection of them. Of these, ten are male and six female. It is not always easy to determine whether a given tumor is primary or secondary to the bladder, and this question is too often disposed of at first glance. From our number of cases collected, I have excluded several announced as "primary cancer," which, on account of extensive involvement of neighboring parts could not be accepted as such without much doubt. Thus, in one instance of reported primary vesical cancer, it is said "the neoplasm involved the *abdominal parietes, rectum, and several coils of small intestine, though it did not implicate either the vesical or intestinal mucous membrane.*" I should think it almost impossible to say where such vast disease had its origin. Again, that the bladder is quite as subject to invasion by metastasis as other organs of the body is a circumstance apparently not kept in view. In some of our cases, the disease in the bladder was undoubtedly recent, and insignificant as compared with the cancerous development elsewhere. Thus we have an instance of "two or three small masses of en-

cephaloid in the bladder, while no part of the left kidney could be found, and a mass of encephaloid occupied its place." If the extent of disease is any index, in this case it is quite possible that the kidney and not the bladder (as stated) was the original seat of the disease. But, on the other hand, we may err in the opposite direction, and regard all cases secondary in which the rectum, prostate, or vesiculæ seminales happen to be continuously affected with the bladder. In other words, I would say, that primary cancer of the bladder may be more common than is generally supposed, and that the disease, instead of originating in the vagina, uterus, rectum, or prostate, these parts are secondarily affected by extension of the disease from the bladder. There is nothing irrational in the acceptance of these premises, and some of our cases make such a conclusion inevitable. When the disease is said to have "apparently involved the prostate," or to have "extended up to it," or "within half an inch of it," or when the tumor is said to have attained considerable size, become ulcerated, etc., within the viscus, while, without, it had simply created adhesions with the outer surface of the uterus, rectum, colon, or small intestine, the natural conclusion is, that the disease, originating in the bladder, would have involved these parts had not death arrested its progress. In not a few cases were such adhesions found between the bladder, uterus, vagina, intestines, abdominal walls, and sometimes ulcerative communication existed between these organs. In one case such a communication existed between the base of the bladder and uterus, the latter serving as an outlet for the urine, which was constantly dribbling away during life. In another, fæces were passed with the urine.

Again, the cancer may develop simultaneously at several points, as in the case of Hutchinson, in which were numerous masses of medullary cancer *perfectly distinct from each other in the submucous tissue of the vagina, rectum, and blad-*

der. I mention these facts as showing that it is often difficult to determine the real origin of cancer of the bladder.

The most frequent locality of cancer appears to be on the posterior wall, the next most common seat is the trigone. Sometimes the attachment is simply given as "on the body," rarely is the vertex mentioned as the seat of the disease.

With reference to age, cancer of the bladder would appear to occur in greatest frequency between the ages of forty and fifty, fifty and sixty, thirty and forty, sixty and seventy-five, and twenty and thirty. Our oldest patient was seventy-five years old. Billroth had a case of myocarcinoma in a boy aged twelve, but cancer rarely occurs before the twentieth year. A unique case is reported by Smyth of medullary cancer in a child four years old, which is in several respects interesting. The symptoms were frequent micturition and hæmaturia, but there was no complaint whatever of pain or tenderness in the abdomen. April 10th, there was sudden discharge of arterial blood, followed by purulent matter, the result, no doubt, of the giving way of an abscess. For some days there was a free discharge of muco-purulent matter tinged with blood. May 29th, after a very restless night, she uttered a most piercing shriek, followed by syncope, and she died in three hours. Abdomen only part examined, bladder much hypertrophied, a cyst of an abscess was discovered on the left, inferiorly, upon the edges of which were phosphatic depositions. Interior of viscus was filled with soft, broken-down, medullary matter, resembling, in fact, pounded cerebral substance. Under microscope, cancer cells were discernible. Kidneys were secondarily affected.

Before passing to the consideration of other varieties of tumor, I will here record two cases of primary cancer which have come under my observation, and which present features of much interest. The first is that of L. F., German, aged 44; shoemaker. Never had any serious

illness; has always enjoyed good health, when at the age of twenty-three, he found, on waking one morning, a considerable quantity of clotted blood in his bed; had no pain. Four years afterward (when twenty-seven), noticed for the first time blood in his urine. It appeared without any assignable cause, and remained only a day. Ten years afterward (when thirty-seven), noticed blood in his urine the second time, which continued some days and disappeared upon taking medicine. Ever since, however, blood has appeared in the urine at intervals, with some pain in micturition. He remained in this condition up to August, 1879, when blood appeared constantly in the urine, sometimes in small and sometimes in large quantities; clots also now appeared for the first time; micturition also became frequent and painful. Admitted to Charity Hospital December 3d, 1879. Anæmic and weak, complains of palpitation of the heart on least exertion. Has pain in his right lower extremity; micturition very frequent and painful, thinks he could pass a pailful of water, but only a few drops come away at a time. The pain in micturition is at the neck of the bladder and at the glans penis. Almost every time he urinates he finds clotted blood in the urine. Has noticed that, while passing water, the stream will suddenly become arrested and start again in a moment, preceded by a clot of blood. Has pain behind the pubes. Urine sp. gr. 1.012 neutral, dark-red, holds about forty per cent of albumen and contains a thick deposit of pus, blood-corpuscles, and epithelium. A stricture was found, five and three-quarter inches from meatus, admitting 16 A. December 10th, thinks he feels better; pain in hypogastrium and thigh gone. December 13th, during the night, was unable to pass water; the bladder became distended and painful; in the morning, a large clot came away, after that the urine again flowed freely. January 6th, always complains of more or less pain in region of right buttock and thigh. Passed a large clot of blood this

morning, previous to which had much pain over hypogastrium. Transferred to Ward 6. In this ward he was in bed most of the time, and was given ergot, gallic acid, iron, etc., but his condition remained unimproved. The patient was seen by me for the first time in March, when by palpation and catheterization I distinctly recognized a tumor at the trigone, involving especially the right side of the bladder. Three days previous to death, patient became semi-comatose, emitted an offensive urinous odor, and fibrillary contractions of the muscles of the arms and neck were observed. Rectal alimentation was necessary, patient's jaws resisting all efforts to open them. Death ensued March 28th, 1880, at 6 P.M.

Autopsy by Dr. Holmes.—Only bladder, ureters, and kidneys were examined. Bladder was contracted, and contained about ʒ ij. of urine. Projecting from the trigone and right wall of the bladder is a mass, circular in form, about four and one-half inches in diameter, considerably elevated, with convex lobulated surface, presenting numerous sulci or depressions, and covered with shreds of tissue. The entire mass is rather pale, and in the contracted condition of the bladder almost completely fills its cavity, being about the size of the fist. Mucous membrane elsewhere is thickened and pale. See Plate v. Ureters: left normal, right moderately dilated and thickened. Kidneys: right is smaller than normal; external surface is of deep color and covered with blackish-red ecchymotic spots. On section, find the kidney in condition of hydronephrosis. What remains of cortical portion—a very narrow rim—is very firm, pale-red, and shows the same ecchymotic condition as the external surface. The lining membrane of the dilated pelvis and calyces is very pale. On cutting through the cortical portion at several points, small masses of secondary cancerous deposit are found; they are about the size of a split pea. Left kidney is swollen, deep-red color, and shows hemorrhages on surface

PLATE V.

Primary Encephaloid Cancer.

Original drawing from one of the author's cases.

PLATE VI.

x 400.

Microscopic appearance of encepnatoid tumor (Pl. V.).

and on section. The cortical substance is markedly swollen; Malpighian bodies prominent and deep-red. The pyramids, deeply congested, columnæ of tubules can be traced almost everywhere; appear broader than normal, and have grayish-yellow color.

Microscopic appearances.—The tumor was examined by Dr. Carl Heitzmann, who found it to consist of delicate fibrous connective tissue, inclosing large and numerous alveoli (Plate vi., A), which latter are filled with large and irregular epithelia. The connective tissue framework is crowded with globular, mostly homogeneous corpuscles, at some places to such an extent that the fibrous structure of the connective tissue is obscured (B). The epithelia within the alveoli are coarsely granular, supplied with large nuclei, either single or multiple. Diagnosis: medullary cancer.

The second patient was that of a lady, aged sixty-nine. Some time during the month of August, 1880, while in the country, and lying in bed one afternoon by the open window, a thunder-storm came on, and during a vivid flash of lightning, felt, as she said, "a shock of electricity, which passed through me from head to foot." Soon after she got up, passed water, and saw that it contained blood. The urine continued to be tinged with blood, though slightly, for about two weeks, during which time she kept her bed, according to her physician's advice, but she had no pain or inconvenience of any kind. After two weeks, she left her bed, and the hæmaturia disappeared spontaneously. From this time to November 11th, there had been no recurrence of hemorrhage, but on this day the urine again became tinged with blood. November 12th, urine free from blood, color pale, quite clear; no appearance of any abnormality to naked eye; no albumen with heat and acid. November 20th, sharp hemorrhage commenced to-day; urine contains large clots; is obliged to empty bladder every twenty minutes to one and a half hours, with con-

siderable bearing-down pains, owing to the presence of clots in the bladder. Gallic acid, ergot, turpentine, iron chloride, aromatic sulphuric acid were administered freely and in large doses, but apparently without any effect. The hemorrhage continued, and the patient became thoroughly anæmic and much exhausted. December 9th, extreme nausea and irritability of stomach; refuses all medicine and nourishment: pulse rapid and feeble, prostration extreme; stimulants and nourishment administered by rectum. For several days little hope was entertained of her recovery. She rallied, however, in a most marvellous manner; the blood gradually disappeared from the urine without any remedies; stomach returned to its normal condition, appetite improved rapidly, and the good old lady became once more herself. December 21st, appetite good; cheerful, and hopeful for the future; urine pale, feebly alkaline; no blood; very little free pus, but quite large flakes of mucoid material, impregnated with triple phosphates, exist in the water, and there is always the same slimy material deposited in the chamber or in the bottle of urine brought for examination. She now complains of frequency of micturition, and a severe burning at the vesical neck at the completion of the act. This is the first time she has complained of any pain other than the bearing down hitherto experienced, consequent upon the expulsion of clots. January 16th, 1881, has continued about the same since last report. Sometimes there is considerable frequency of micturition, with pain; while, again, she is capable of holding water several hours, and there is absolute freedom from pain during micturition. Gelatinous particles still float in the urine, and slimy deposit continues, but not nearly so much as before. There has also been an occasional reappearance of the hæmaturia, but not for some eight or ten days; is to sit up a few hours daily. January 21st, had considerable pain in region of left kidney, extending downward over the left side of

bladder. Applied turpentine stupes, which gave partial relief. Nevertheless, she continued to complain of considerable pain, especially over left side of bladder, and extending down the thigh, for some ten days afterward. At times the pain would be slight, and again quite sharp. There had been an occasional recurrence of the hæmaturia, blood appearing, perhaps, at one micturition, while at the next the urine would be perfectly clear. February 10th, has been sitting up a few hours almost daily since January 16th. Has taken iron, quinine, etc., but during the past five or six days there has been more or less blood in the urine nearly all the time. Is very nervous, and appetite is again failing rapidly. Again proposed a digital exploration of the interior of the bladder, with the view of possibly effecting the removal of the tumor. Hoping, however, to become stronger in a few days, she requested that the examination should be again deferred. February 13th, hemorrhage again profuse; passes water every twenty or thirty minutes; considerable bearing-down pains from the accumulation of clots in the bladder; excessive nausea; unable to retain anything on stomach, excepting very small quantity of champagne. Nutritive and stimulating enemata were given, but she sank rapidly, and died at 8 A.M., February 15th, 1881.

Autopsy made Feb. 17th. Only bladder and left kidney examined. Bladder found distended with soft clots, its walls much atonied, being extremely thin at the vertex. Mucous membrane vascular throughout. A tumor was found, situated directly over the orifice of the left ureter. It was about four and a half inches in diameter, and projected from the surface about an inch. It was attached by a broad base, nearly equal in diameter with the rest of the tumor, and its surface presented the shaggy appearance characteristic of villous growths (see Plate vii.). On the opposite side, the coats of the bladder are also infiltrated with cancerous material. Left ureter dilated and

PLATE VII.

Primary Villous Cancer.

Original drawing from one of the author's cases.

PLATE VIII.

x 200.

Microscopic appearance of villous cancer (Pl. VII.).

hypertrophied, especially at entrance into bladder. Left kidney small, pelvis dilated, pyelitis and cystic change commencing in the organ itself. Right kidney was accidentally returned into abdomen without examination. Vagina, uterus, rectum, and neighboring organs were entirely free from disease. Microscopic examination by Dr. C. Heitzmann found the tumor to be composed of a rather coarse, fibrous connective tissue, highly vascularized, and sprouting on the surface into numerous bud-like elongations (Plate viii., A), varying in length from 0.01 mm. to 3–4 mm. Most of the buds are covered with a single, irregular, columnar epithelium; the elongations themselves, as well as the subjacent connective tissue, is infiltrated with numerous, partly globular, partly oblong corpuscles (B). Within the connective tissue are seen alveoli of small size (nests, C), containing a number of epithelia: the latter are mostly provided with only *one* nucleus. Diagnosis, villous cancer.

MYOMATA.

Myomata occur very rarely in the bladder. The following are, no doubt, the only instances of this new-formation that can be found in literature.

Myo-carcinoma.—Virchow, in his work on "Geschwülste," makes allusion to this form of tumor in the description of a myo-carcinoma, which was situated on the posterior wall of the bladder, towards the point of the trigone. The greater part of the tumor was apparent in the submucous tissue; but its deeper portion was continuous with the muscular coat. Microscopic examination showed a great resemblance to a genuine myoma. The portion lying in the submucous tissue showed entirely the structure of scirrhus.

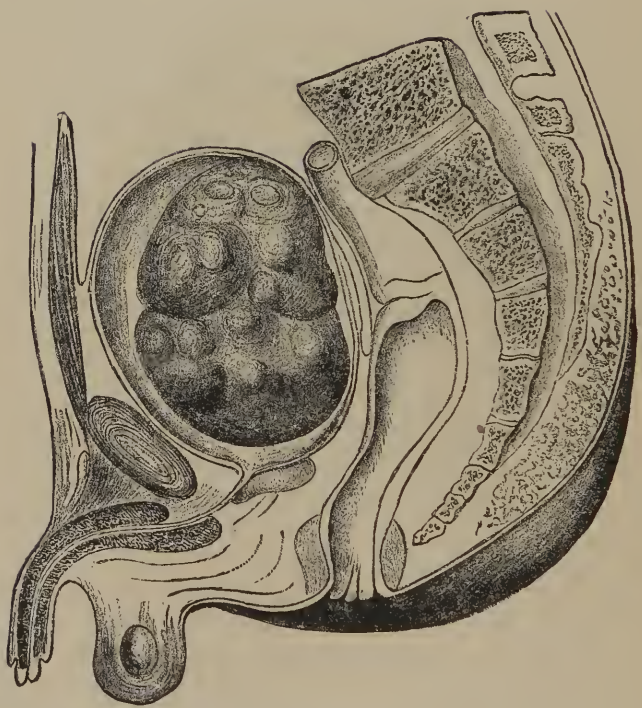
Faye mentions a case of supposed fibro-myoma. The tumor was situated between the anterior wall of the bladder and the fascia transversalis. It was eighteen to

nineteen centimetres long, sixteen to seventeen broad, and ten centimetres thick. It was so intimately connected with the vesical wall, that it seemed to have its origin therein, though Faye says it is possible that it originated in the subperitoneal connective tissue.

Myo-sarcoma and carcinoma.—A patient of Billroth, aged twelve years, was troubled for ten months with frequent and painful micturition. The urine remained feebly acid, slightly cloudy, but contained nothing characteristic on microscopic examination, except a moderate quantity of pus-corpuscles, and a few cells of bladder epithelium. A tumor was felt through the abdominal walls, about the size of the fist. It could also be felt through the rectum. The tumor, which was successfully removed by supra-pubic incision, had its origin from the posterior wall, and extended towards the top of the bladder. It was eight centimetres long, four broad, and eighteen in circumference in one direction, and thirteen in another: its base was seven centimetres. Its surface was nodulated; it was smooth and not ulcerated. It took its origin distinctly from the muscular coat, and was, therefore, a myoma, but the tumor had undergone a sarcomatous, and, in places, a carcinomatous transformation. (Plate ix., shows the relative size, form, seat, etc., of tumor.)

The next three cases are instances of pure myoma. The first is Volkmann's patient, aged fifty-four. For six months has suffered from tenesmus, strangury, sharp pains in glans penis during micturition, and hemorrhage, with production of large clots. Urine contains *neither mucus nor pus-corpuscles*. Bimanual examination reveals a hard, elastic, and easily movable tumor in the upper part of the bladder, about the size of a hen's egg. The tumor was unsuccessfully removed by supra-pubic incision. It was 8.25 cm. long, 6.5 broad, 21.5 cm. in longitudinal, and 17.75 in transverse circumference. The pedicle was half an inch long, and of the thickness of the little finger, and attached

PLATE IX.



Billroth's Myo-sarcoma and Carcinoma.—*Arch. f. Klin. Chir.*, Bd. 18.

PLATE X.

Volkmann's Myoma.—*Arch. f. Klin. Chir.*, Bd. 19.

to the vertex anteriorly, and a little to the left. The tumor was of the size and form represented at Plate x., and microscopic examination found it to be a pure myoma. Dr. H. Chiarri, prosector to the Rudolfs-Spital, Vienna, found, post-mortem, two cases of pure myoma, which are described by Belfield, in the *Wien. Med. Wochschr.* The first was a female, aged fifty, who died of bilateral pleuro-pneumonia. On the outer surface of the contracted bladder, and on the left side of its base was a firm, sharply-defined tumor the size of a nut, imbedded in the loose, perivesical areolar tissue. It had the shape of an egg with its longitudinal axis directed vertically, and had a smooth surface. It was two centimetres long, one centimetre thick, and two centimetres broad. On removing the surrounding adipose tissue, there appeared four thin cords (Stränge), which could be traced from the under surface of the tumor into the muscular coat of the bladder, and consisted partly of smooth muscular fibres, and in part of blood-vessels. These cords led through an elliptical gap, fifteen millimetres long and eight millimetres wide, in the external muscular layer into the inner layers of the muscular coat, which made it evident that the tumor had its origin therein. It had no connection with the uterus, which also had a myoma the size of a bean on the anterior surface of its fundus beneath the peritoneum.

The second subject was a male aged seventy-four, who died of pneumonia. There was considerable enlargement of the middle lobe of the prostate, which was otherwise only slightly tumefied. The muscular coat of the bladder was considerably hypertrophied, and its mucous membrane was in a condition of catarrhal inflammation. The left ureter was greatly dilated, and the corresponding kidney hydronephrotic; the right kidney was not changed. The cause for the dilatation of the left kidney and the hydronephrosis was the existence of a small tumor covered with mucous membrane, just below the orifice of the

left ureter which it compressed. The tumor was tuberous, and could be enucleated (ausschälbar). It had a diameter of seven millimetres. Both these tumors had their origin, undoubtedly, from the muscular tissue of the bladder. They were carefully examined under the microscope and with the proper reagents, and were found to be composed of organic muscular fibres, with a little connective tissue and blood-vessels. It is interesting to note the coincidence of a myoma of the uterus in one case, and the hypertrophied condition of the prostate in the other.

SARCOMATA.

Sarcoma is one of the rarest diseases of the bladder; there are but few authentic cases on record. The first of these was recorded by Senftleben in 1860. A woman, aged twenty-nine, was troubled with irritable bladder, incontinence, and hæmaturia. She had noticed that in straining at stool a reddish fleshy mass appeared at the meatus, which she herself cut away several times without pain. When she applied for treatment, the hypogastrium was tender on pressure, an inguinal gland on the right side was as large as a walnut. The urethra had been dilated by the tumor sufficiently to admit the index finger. Examination revealed a soft elastic tumor attached by a broad pedicle to the posterior and upper part of the bladder. A piece of the tumor was torn away and examined microscopically by Billroth, who declared it to be a *spindle-celled* sarcoma. The greater part of this mass was afterward removed, but the patient died on the fourth day from purulent peritonitis, the bladder having been perforated during the operation. Autopsy revealed another tumor which had its origin from the intermuscular connective tissue.

Marchana's patient, a female, aged fifty-seven, had suffered for two years with vesical catarrh; there had been considerable strangury and tenesmus vesicæ, and every half-hour a few drops of thick, highly fœtid urine, contain-

ing shreds of tissue, were passed. *There was never any hæmaturia.* After bloodless dilatation of the urethra the finger discovered a tumor on the lower and posterior wall of the bladder. It was found that the tumor and the vesical wall were in firm connection with the uterus, and for that reason no attempt was made at extirpation. Patient died of exhaustion. P. M. Posterior wall and trigone of the bladder was occupied by a tumor the size of an apple (Borsdorfer Apfel). The principal mass was situated in the right half of the bladder, while in the centre and towards the left the greater portion of the tumor was broken down and had a deep ragged ulcerated sulcus. Tumor occupied pretty much the entire thickness of the vesical wall, had its origin from the intermuscular connective tissue, and microscopically presented the structure of a *round-celled* sarcoma. The anterior wall of the vagina and of the uterus, which were connected to the bladder by a firm structure, were entirely unaffected. The rest of the bladder was scarcely thickened. There were metastatic deposits in the lung, hydronephrosis, pyelonephritis, etc.

Heath reports the case of a female aged thirty-nine. *Passed little blood with urine at various times for several years, complained of constant desire to micturate, but in doing so experienced no pain or difficulty, although evidences of inflammation were most marked.* The urethra was dilated and the right side of the bladder was found to be occupied by a villous growth, situated on a hardened base. Some of the growth was torn away. Patient died from general exhaustion. Inner surface of bladder was found to be covered with villous processes coated with phosphatic deposits. Several growths external to the bladder were found. Microscope showed new-growths to be medium-sized, round-celled sarcomata, and the villous growth in the bladder rested on a hardened base made up of round cells rather larger than granulation cells. Kidneys were ex-

tensively diseased, and a tubercular mass undergoing caseation was found in the lungs.

Knowsley Thornton speaks of having scraped away a portion of a small growth from the bladder with his nail which, under the microscope, proved to be a round-celled sarcoma.

Stimson exhibited (New York Pathological Society) the bladder of a man aged sixty-three, who had complained of frequent and painful passage of bloody urine. There was a sarcoma three inches in diameter, attached by a pedicle as thick as the finger to the posterior wall and about four inches above the vesical neck.

As secondarily affecting the bladder we have three cases, all occurring in female children, and originating in the vagina. The first case (Sänger) is a typical round-celled sarcoma (sarcoma medullare) situated on the anterior columnæ rugorum vaginæ of a girl three years old, which later attacked the bladder and caused death by perforation and peritonitis. The second (Ahlfeld) was a congenital fibro-sarcoma, which filled the vagina with polypoid growths and also affected the bladder. The third (Soltmann) was a girl two and a half years old with a mucous-membrane sarcoma of the vagina, characteristic in its grape-like form, leaving the uterus free and attacking the bladder.

From the above cases, few as they are, we learn that sarcoma, like carcinoma, may be primary or secondary to the bladder; that it may be of the spindle-celled or of the round-celled variety, and that it may take on the villous form. With regard to frequency it will appear that sarcoma of the bladder as found in literature is rare. Nevertheless, seeing the resemblance between round-celled sarcoma and encephaloid cancer in regard both to their clinical and physical characters, and in the absence of microscopical data, we are with Gross in the belief, that probably many tumors formerly described as encephaloid cancer, belonged to the variety of soft sarcomata.

Tumors sometimes undergo calcareous transformation. Civiale mentions the case of a negro aged fifteen whom Middleton twice subjected to lithotomy without finding a stone. At the autopsy they discovered a bony cyst the size of a chestnut. In 1828 a woman appeared at L'Hôtel Dieu with symptom of stone. Dupuytren examined this patient without finding anything. She died of cystitis, and there was discovered a pediculated tumor the size of a large turkey's egg entirely ossified.

The *etiology* of tumors of the bladder is obscure. Civiale and other writers have endeavored to attribute their origin to some continued local irritation, as the prolonged use of the catheter, the presence of calculi, etc., but I think upon insufficient grounds. In the majority of cases it is impossible to assign any injury or irritation as the exciting cause, and in those not very common cases in which calculi co-exist with the new-formation, the evidence is strong that the concretion was formed subsequent to, rather than before the development of the tumor.

SYMPTOMS.

All tumors of the bladder present, more or less, sooner or later the triple symptoms—hæmaturia, irritable bladder, and pain. We shall take up those symptoms in the order mentioned, and consider them as they apply to each form of vesical growth.

Hæmaturia varies in respect to constancy, time of appearance, and quantity of blood lost, with the nature of the tumor. In villous growth it is always a most prominent and unfailing symptom; it is never absent during the entire course of the disease. This is to be expected in consideration of the peculiar structure and vascularity of these growths, made up as they are of delicate capillary loops which are constantly subjected to friction and injury by the powerful contractions of the bladder. The hæmaturia appears early. It is often the first and sometimes the only

symptom throughout the complaint, as in the patients of Partridge and Hooper. The first was a man not in bad health, with no pain, and beyond the bleeding had no indications of bladder or renal disease. After death from cholera, there was found a pedunculated polypus covered over its whole surface with long villi. When the specimen was fresh, the villi were very florid and congested. The mass was about the size of half a walnut and attached by a pedicle of the thickness of a crow quill to the trigone. The mucous membrane of the bladder was perfectly healthy.

Hooper's patient, male, aged thirty-four. About four months before death, without any premonitory symptom, observed blood in the urine; it was unattended with pain or any other symptom. The bleeding continuing, applied a month later for medical advice. He described the quantity of blood which had been lost as very great and his appearance was exceedingly blanched and pale. He had not lost flesh, had good appetite, no pain anywhere, and excepting the hæmaturia there were no indications of vesical disease. Remedies were given to arrest bleeding, but without avail. The man sank from sheer bloodlessness. P. M. Every organ in the body was found healthy, with the exception of the bladder. Near the opening of the right ureter was a peculiar tufted growth about the diameter of a sixpence, and one-eighth of an inch in depth or thickness, and in its vicinity were two or three much smaller and more vascular-looking tufts, but possessing the same general characters. Capacity of bladder was normal and its coats healthy.

In villous growths, blood may appear in the urine at the beginning, during, or at the end of micturition. In the commencement of the disease, it is often observed that the first half or two-thirds of the urine passed is perfectly clear, while that which appears towards the last is bloody, or it may be that the flow remains clear to the end, a few

drops of almost pure blood being expelled with the coup de piston. The latter phenomenon is undoubtedly due to the injury inflicted upon the tumor by the powerful expulsive effort of the bladder at the end of micturition, and by the forcible squeezing of the tumor into the vesical orifice at this time. For this reason, too, even if the urine is tinged throughout and from the beginning, that which comes last invariably contains most blood.

The quantity of blood lost varies from a mere parenchymatous oozing to a free hemorrhage. In the first case, the urine will be simply tinged with blood; in the latter, it will be of a dark-claret or venous-blood color, and contain numerous and large clots. The amount of hemorrhage is usually commensurate with the size of the tumor, although death has resulted from sheer loss of blood from a growth not much exceeding the size of a pea.

The hæmaturia is apt to be intermittent, especially at first. In the beginning of the complaint, it may be noticed that the urine is tinged with blood, but in a few days all signs of hemorrhage disappear, and the unpleasant visitor is forgotten for possibly some weeks or even months, when it reappears. Thus it may come and go several times, each time the intervals becoming shorter, until the hemorrhage recurs every other day, every day, and, finally, with every micturition. With the increase in the frequency, there is also generally an increase in the quantity of blood passed.

The hemorrhage seems to come often without any assignable or exciting cause. The urine may be perfectly clear one day, while on the next, under circumstances of rest, quiet, and treatment, precisely the same active hemorrhage may ensue. This was notably observed in my patient with villous cancer who had had continued and quite profuse hemorrhage for nearly three weeks, during which time she was constantly under the free use of internal astringents, with apparently no effect. Her stomach re-

belled; she refused all food and medicine, and fell into a condition of collapse; but from that time the hemorrhage commenced to diminish, and in a few days ceased spontaneously, without any treatment whatever. Nor does exercise necessarily bring on a hemorrhage, as shown in Dr. Hudson's patient, who walked a distance of nine miles, yet neither that day, nor for three days afterwards, did any appreciable amount of blood appear.

In cancer, hemorrhage, although a prominent symptom, does not occur until later in the disease, because these growths do not bleed until some ulceration has taken place, or until, perhaps, the simple epithelioma has developed into a villous growth by the sprouting of vascular processes on its surface. Hence, when hæmaturia exists, it is usually associated at once (Dickinson's case a remarkable exception) with irritable bladder. In fact, frequent micturition, pain, and even catarrh of the bladder may exist for some time before hæmaturia occurs. Indeed, the latter symptom sometimes remains absent to the end, as in the following instructive cases.

In the patient of Sept. Gibbon, there had been difficulty in voiding urine for nine months. Afterwards, urine was drawn off by catheter, but he had *no hæmaturia*. Death occurring from cancerous cachexia, the bladder was found occupied by a *medullary* growth about the *size of two fists*.

In Ashhurst's patient, the walls of the bladder were infiltrated with cancerous material, and the abdominal parietes, rectum, and several coils of small intestine were invaded, but there had been an entire freedom from hæmaturia. The immediate cause of death was attributed more to pulmonary disease, not cancerous, than to the vesical cancer.

In Sanders' patient, there was extensive dentritic cancer, involving the whole interior of the bladder, obstructing completely the left ureter, *patient passed fragments of cancer*, and yet there was no hæmaturia at any time.

Rankin's patient had been passing large quantities of blood, but for at least twenty-four days previous to death had no hemorrhage. Lower part of abdomen was occupied by a tumor the size of a child's head. Evidently the bladder consisted of a solid mass, by the occupation of its left wall by an encephaloid cancer. Iliac glands were cancerous, and the vesiculæ seminales and adjacent parts were agglutinated into a large supplementary tumor. Whole mass weighed three pounds.

With regard to the constancy of hæmaturia in the other varieties of tumor, it may be said to depend, as in cancer, largely upon the presence or absence of surface erosion, or ulceration, injury inflicted by instrumentation, etc.

Fibrous polypi are not nearly as prone to bleed as mucous polypi, and hemorrhage is much less characteristic of the latter than of villous growths.

Marchand's sarcoma and Billroth's mixed tumor were both large, yet in neither was there ever any hemorrhage; nor was the hemorrhage other than slight in the sarcomata of Senftleben and Heath.

In Volkmann's pure myoma, the urine became towards the last very bloody; but this was accounted for, after death, in the ulcerated and gangrenous condition of the tumor at its surface.

Irritable Bladder and Pain.

We have mentioned hæmaturia first, because it is the most characteristic symptom, not because it is usually the first that appears; for although in a certain proportion of villous growths bloody urine is the first symptom that attracts attention, in a majority of these cases, as par excellence in all the other varieties of vesical tumor, symptoms of irritable bladder precede the appearance of blood in the urine. In fact, frequency in micturition is often the only symptom that exists for months. This becomes more and more annoying with the progress of the disease, until

finally the bladder never feels entirely empty, and the desire to void urine is almost constant. The presence of blood in the urine always aggravates the irritability of the bladder, and if this has not existed as an independent symptom, it is sure to be a feature associated with hæmaturia.

But what an incomprehensible organ the urinary bladder is! So simple in structure, so complex in mechanism! How easily, and from what insignificant causes is it excited to irritability! And yet how tolerant at times of irritation, and even of extensive structural changes within its walls!

The following cases related by J. Matthews Duncan are very instructive examples illustrating the occasional tolerance of the bladder to disease.

"A woman died under my care from perimetric abcess and tubercular peritonitis. The perimetric abscess was a consequence of parturition, and it burst into the ileum. Simultaneously, with the diminution of the abscess, the urine became bloody and carried with it a large amount of pus. I never doubted that the abscess had burst through the bladder. Pus was never observed in the stools. A post-mortem examination was held, and there was found no communication between the bladder and the abscess. The bladder was only slightly contracted, and the whole of its mucous membrane was dark-red, in a state of the highest degree of catarrhal inflammation: secreting pus, and also exuding blood. The woman had no irritability of bladder; she never complained of that organ."

"Another case is that of a patient with great hæmaturia. The case was diagnosed as being not one of disease of the bladder, on account of the physical examination revealing a healthy condition, so far as it could be made out. The woman died suddenly, and the bladder was found to be everywhere dark-red; and on its internal surface there were several nodules of soft cancer."

As a rule, the amount of irritation and functional disturbance created by a growth in the bladder depends upon its location and size. Tumors situated near the vesical neck, even if small are more apt to give rise to trouble than larger ones situated at the vertex. An instance of extensive disease at the vertex of the bladder, with remarkable immunity from severe symptoms, is given by Ultzmann. A cancer, the size of the fist, situated at the vertex of the bladder, perforated the abdominal wall above the symphysis, and formed a vesico-abdominal fistula, through which urine escaped as if from a spring. Throughout this destructive process, the pain was always very moderate. The patient died of septicæmia after the right inguinal glands became so much infiltrated and enlarged as to obstruct the circulation in the lower extremity and transform the leg into a swollen, shapeless mass.

In malignant growths, characteristic lancinating or darting pains may be looked for in the region of the bladder; but the absence of this symptom in several of our grave cases (Heath, Smyth, Ashhurst, Stein) shows that pain is not pathognomonic of vesical cancer. Benign growths are never in themselves painful, though by their presence they give rise to disturbances which often occasion much suffering and distress. If pain is not associated with frequent micturition at the outset, it very soon becomes a feature of the complaint. It is usually located at the vesical neck and perinæum, or commencing here, radiates in all directions; but especially does it extend along the urethra to the glans penis, and towards the rectum. It is always worse during the final act of micturition; and if clots have accumulated, or have become impacted in the vesical orifice, the expulsion of these is always attended with severe bearing-down pains, tenesmus, and spasm. Often enough in simple growths, there is no pain excepting during free hemorrhage and the formation of clots in the

bladder, which, when expelled, afford rest and freedom from suffering. Sometimes there is a more or less steady pain in the region of the buttock and back of the thigh, on the side corresponding to the seat of the disease, probably caused by pressure of the tumor upon the sacral nerves. Later on, also, there may be pain in the region of the kidney, shooting downward toward the bladder. This, too, is usually on the side with the vesical growth. This pain may be purely reflex; but if persistent, is suspicious of a hydronephrotic condition or structural change in the kidney. Sometimes there is a sensation during micturition as if something was forced against the neck of the bladder. Pediculated growths are often so situated that they lie over the vesical orifice or are propelled in that direction during the evacuation of the bladder; and it thus happens that the flow of urine is sometimes momentarily interrupted, which, in the absence of stone, is a characteristic symptom of pediculated tumors. Furthermore, these growths sometimes become engaged in and block up the vesical orifice, either partially or completely, occasioning spasm, much difficulty in micturition, and retention of urine, requiring constant catheterization. On the other hand, they may occasion incontinence from the gagging and dilatation of the vesical orifice.

DIAGNOSIS.

In point of diagnosis in the female, the most unequivocal evidence of the disease is not unfrequently obtained from the protrusion of the growth at the meatus. This was manifest in the cases of Warner, Pleininger, Warner, Theinemann, Shaw, Senftleben, Guersant, Birkett, Bishop, Marsh, Schatz, Winckel, Godson, Barton. In one or two instances, the protrusion was incomplete, that is, the growth extended into the urethra, but not beyond; in all the others, the tumors appeared external to the meatus. In some cases, the protrusion was constant, but most

frequently the growths appeared only with straining at stool or during micturition. Pleininger's patient was an exception to this rule; she had prolapsus of rectum during stool, and the projecting mass from the urethra, which was of the form and size of a strawberry, always returned with the descent of the gut. In some instances, the urethra was enormously dilated by the descending growths, sometimes only at its upper portion, sometimes its entire length. In Schatz's patient, the lower fourth of the urethra had retained its normal calibre, but the canal behind this was dilated to the diameter of the finger, in which projected a tumor the size of a goose's egg. In Theinemann's patient, a polypus the size of a hen's egg protruded from the urethra, which could readily be entered with the two fingers. In Marsh's patient, the polypi so far distended the urethra that "at first this canal was mistaken for the vagina."

In all doubtful or obscure cases, the passage of portions of a growth with the urine is a most fortunate circumstance, as it affords not only positive evidence of the existence of a tumor, but, which is still more important, may determine the propriety of attempting its removal. This is happily not a very unfrequent occurrence. Kocher, Bryant, Brennecke, Thompson, Harrison, Hill, Ultzmann, Dickinson, Alexander, Sanders, Hicks, Marcacci, Senftleben, Volkmann, Winckel, and others, make special mention of having observed portions or fragments of tumor in the urine. Winckel's patient showed him a mass of warty bodies, nearly the size of a hazel-nut, and in quantity sufficient to fill a medium-sized tumbler, which had come away, from time to time, by the urethra, and it was said that eight months afterwards a mass came away large enough to fill a glass of one hundred grammes capacity. The portion of Volkmann's tumor thus passed was the size of the little finger.

The spontaneous expulsion of portions of tumor is gen-

erally followed by great relief to the patient, and in some instances permanent cure has thus been effected. Ultzmann speaks of an elderly man, much exhausted from hæmaturia, from whom villous masses came away ; the patient remaining well three years afterward. Bryant mentions a case of Hicks' in which a large mass was passed with apparently similar result. But the most remarkable instance is that of Brennecke. A woman, aged thirty-four, found herself in the sixth month of her fourth pregnancy, in the beginning of May, 1876; for about three weeks suffered with an intense vesical catarrh, and occasionally with sudden stoppage in the evacuation of urine. Dr. B. was called to see her on account of some bearing-down pains. After fifteen or twenty hours of tormenting pain, there was expelled from the urethra a tumor fully the size and shape of the kidney of a new-born child. From that moment the symptoms of vesical catarrh ceased. The pregnancy went on to full term, and she gave birth to a living boy. The report was made April 12th, 1879, and the woman remained well up to that time. The tumor is said to have been a fibro-myxoma originating from the mucous membrane or the submucous tissue of the bladder.

Small polypoid or pediculated growths becoming accidentally engaged in the eye of a catheter have been removed by avulsion and have thus served to establish the diagnosis, and in some cases permanent recovery seems to have resulted. Mass says he has removed mucous polypi in this manner from three patients. The first, a man aged fifty-three, suffered with repeated hæmaturia, etc. On washing out the bladder, the outflow of urine was suddenly arrested by the impaction in the eye of the catheter of a mucous polypus of the size of a hazel-nut, with a short, broad pedicle; a second and similar growth was removed at the same sitting and in the same way. The patient remained free from a repetition of the hæmaturia. In the second patient, aged thirty-three, a large single

catheter was passed, to which was attached an arrangement of elastic tubing, and a funnel, by means of which fluid could be injected or withdrawn from the bladder at pleasure. After a few injections, an elongated polypoid growth was caught in the eye of the catheter and extracted as in the former case. In the third patient, aged thirty-eight, injections were made in the same manner, and a small polypus with a long thin pedicle soon stopped up the eye of the catheter and was removed.

Ultzmann refers to a man, aged sixty, with hæmaturia, dysuria, etc. He introduced a metal catheter, and removed bloody urine, and in attempting to withdraw the instrument, felt that it was held; removing it, however, he saw projecting from the eye of the catheter a villous growth three centimetres in length. The man did not suffer any more from dysuria or hæmaturia. Six months later he died, as it was said, from disease of the stomach.

Mr. Bryant also, while catheterizing a female child, accidentally pulled away a small villous growth which had become caught in the eye of the instrument.

All the forms of tumor found in the bladder, papillomata, polypi, sarcomata, carcinomata, and even myomata, have manifested their presence by the appearence of small fragments of their structure in the urine, but this is a special attribute of villous growths, both simple and malignant, whose characteristic appearance can generally be recognized under water by the unaided sight. If the particles are small, and the urine very bloody, it may be very difficult to find them. They should always be sought for, if possible during the intervals of hemorrhage, when the urine is clear. From coagula, however, they may be distinguished in that they are of a lighter color, and have a more firm, fleshy consistence.

With regard to the histological data, obtained by the microscopic examination of minute particles of villous tissue, it is not to be expected that the villous structure

will always present its characteristic appearance unchanged. This may be expected when larger portions have recently been detached and removed fresh with the urine; but the filamentous shreds, so often found, have been detached by a slower necrotic process, and no longer present the perfect capillary loop, with its epithelial covering. Distinct and well-preserved villi are more apt to be found as coming from benign villous growths than from villous cancer, because the former, having a thinner epithelial covering, its structure is more apparent; it is less frequently subjected to the disintegrating influence of ammoniacal urine, and the field of observation is not so apt to be obscured by the presence of pus, ammonio-magnesian phosphates, etc., as it is in malignant disease.

Ultzmann calls attention to a condition of urine known as fibrinuria as an important diagnostic feature in villous growths. According to this writer, the urine when first passed, although very watery (dünnflüssig) and of a reddish-yellow color, coagulates after a few minutes into a glutinous mass, which can scarcely be drawn from the glass. It is especially to be noticed that such urine does not contain much blood, as shown by the color, which is not blood-red, but a yellow-reddish hue, and, therefore, the quantity of coagulum is not in proportion to the quantity of blood present in the urine. Furthermore, the coagula are formed in a few seconds after the urine has passed, and may subsequently be rendered fluid by a little shaking; while blood not only requires a longer time to coagulate, but does not become fluid by stirring. Ultzmann says that he has observed this condition of urine in three cases of villous growths.

In my own patient with villous cancer, I observed this remarkable condition of urine almost constantly during her illness; at times even when it could scarcely be said that the urine was colored, light particles of coagula were found floating therein in abundance, and when picked out

and placed under the microscope, presented an extremely delicate interlacing network of fibres, in the meshes of which were crystals of triple phosphates. The urine contained remarkably few pus-corpuscles, and the reaction was never more than feebly alkaline. Ultzmann's theory with respect to this phenomenon is, that, owing to the powerful spasmodic contractions of the bladder, the return circulation from the villi is interfered with, and turgescence of the vascular loops occurs. If the blood-pressure is very great, the vessels rupture, and hemorrhage ensues; if the tension is not sufficient to cause rupture of the vessels, a transudation of plasma occurs, whose fibrin coagulates on the emission of the urine. This increased vascular tension also accounts for the presence of more albumen in the urine than would correspond to the quantity of blood and pus present.

With regard to the evidence furnished by the microscopic examination of the urine in cancer, it may be said that, when associated with hæmaturia and other symptoms, the presence of numerous and irregularly-shaped epithelial cells is highly confirmatory of the existence of cancer, but the presence in the urine of such epithelia is sometimes very misleading, and the microscope cannot be relied upon as a means of diagnosis, unless tangible fragments are passed with the urine—a circumstance not of frequent occurrence in this class of tumors. Dickinson says, "No isolated or detached cells found in the urine can be regarded as proof of cancer in the urinary tract; while the absence of such cells present no argument in favor of the freedom of the bladder or kidneys from malignant disease. Under circumstances of irritation and disturbance, large cells, presenting quite the ideal of cancer cells of all shapes and character, regular and irregular, rounded, angular, and elongated, are occasionally thrown off in abundance from various parts of the urinary mucous membrane. Patients who, upon the evidence of urine presenting such appear-

ance, have been convicted of cancer, have been known to get well and remain so." Sir Henry Thompson says, "Some of the best 'cancer cells' I ever saw in my life were collected from a patient's urine and placed under the microscope by an eminent microscopic observer, for the purpose of a very important consultation. After a careful examination of the patient, I admitted the beauty and perfection of the microscopic observation, but on larger grounds denied the existence of cancer in the bladder, and the ultimate result, happily for the patient, confirmed that view and disproved the cell."

In the four cases of tumor which have come under my observation, frequent and daily examinations were made, and in only one, in which flocculi were visible to the naked eye, was ever any positive evidence of the disease manifest in the urine. Exceptional then, as this is, the two following cases of Dickinson and Sanders are interesting instances in which the diagnosis of cancer was clearly made by the microscope. The first is especially instructive in that the presence of the growth was recognized even before there were any subjective symptoms pointing to the disease.

On July 24th, 1868, Dr. Dickinson was called upon to examine some blood-tinged urine which contained small, soft, buff-colored lumps, that had very much the appearance of fibrinous coagula, for which they were at first mistaken. These masses had drawn attention by briefly obstructing the urethra during their passage. The urine had been passed by a man aged fifty-one, in robust and vigorous health. Excepting what had been observed in the urine, there had been no symptoms pointing to the urinary organs, or to any other part of the body, as the seat of disease. On placing a portion of one of the soft masses under the microscope, it was found to belong to a malignant tumor, apparently of the encephaloid kind; but so complete was the absence of bladder symptoms, and so

perfect the apparent health of the patient, that this view of the case was at first received with incredulity; but towards the end of August it was found that carriage exercise, to which the patient had been much used, had to be given up in consequence of the pain it produced. The bladder became the seat of more or less constant pain, and at intervals of from two to three weeks, irregular lumps of soft matter, looking very much like cerebral tissue, mixed with blood and phosphatic deposit, and of all sizes up to a culinary bean were passed, always with great relief of the pain. Blood was now frequently passed, and as the winter approached, the general health gradually broke down. The bladder became exceedingly irritable, and micturition was attended with some pain. The patient was gradually worn out by his sufferings, and died March 24th, 1869. There was no autopsy held; but as he says, it is not possible to doubt either the seat or nature of the tumor.

Sanders' patient, male, aged forty-three, passed fragments of cancer, sometimes of small size, like mere shreds, at other times forming cylindrical plugs about an inch long, which often became impacted in the urethra and obstructed the flow of urine. There was no hæmaturia at any time. The post-mortem showed extensive, dentritic cancer, involving the whole interior of the bladder.

In the male, there is often much difficulty in ascertaining the presence of a tumor in the bladder. The ordinary digital examination is often fruitless. If the tumor is large, and situated at the vertex, it may be felt through the abdominal parietes; if situated at the bas fond, and is sufficiently large, or has infiltrated the coats of the bladder, it may be recognized by the finger in the rectum. But tumors rarely grow from the superior fundus of the bladder; and, what is of still greater importance, those tumors which are most amenable to radical treatment by extirpation, and which it is especially important to discover as early as possible, are usually soft, pediculated growths,

which do not involve the thickness of the vesical walls, and which readily escape recognition by ordinary rectal examination. Even in the female, where the bladder is certainly more accessible to palpation through the vagina, such tumors constantly escape detection.

In the male especially, but also in the female, the bimanual method of palpation should always be instituted. This consists in introducing one or two fingers as far as possible into the rectum, or into the vagina, and while palpating, an assistant, with both hands flat on the hypogastrium, presses downwards and backwards with the ball of the hand; the surgeon now crowds one hand under the hands of the assistant, and thus manipulates the growth between his fingers. In this manner, Volkmann felt a tumor through the rectum, which was situated at the vertex of the bladder, and which before had entirely eluded his search. If necessary, the entire hand, if not too large, can be introduced into the rectum, when the moderately distended bladder is easily recognized as a fluctuating tumor behind the prostate, and may be thoroughly palpated for the detection of a foreign growth. This examination can scarcely fail to afford intelligence of the presence of a tumor. The patient should be anæsthetized, and the introduction of the hand into the rectum should be very gradual, passing first two, then three and four fingers, and finally, the entire hand. The introduction is facilitated by pressure with the other hand over the abdomen; and unless the hand is very large, which, perhaps, should not exceed nine inches in circumference, or its introduction is too rapid, the sphincter will remain intact, and no incontinence of fæces or other trouble will supervene.

In exploring the interior of the bladder, a short-beaked catheter or sound should be employed, because it admits of greater freedom of movement, and can be better made to sweep over the walls and fundus of the viscus. The

exploration should always be conducted with the finger in the rectum or vagina, and, if possible, still further assisted by crowding down the bladder by pressure from above. We will thus rarely fail to make out the presence of a tumor. Certain small, soft growths, not offering any resistance to the instrument, and small tumors situated on the anterior wall have more than once escaped the *tactus eruditus;* but ordinarily, the deviation of the beak of the instrument to one side or the other, the obstacle encountered in its movements, the thickness and consistence of the structures interposed between the finger and the instrument, the production of pain by the impingement of the sound against the tumor, the hæmaturia induced by the manipulation, especially if the tumor is of the villous variety, will all tend clearly to define, not only the existence of a tumor, but also its location, mobility, and, to a certain extent, its size.

But whatever difficulty may present in obtaining the desired information in the male, in the female all doubt may be set aside by dilating the urethra and making the bladder accessible to direct exploration. It is thus scarcely possible to overlook the presence of a tumor in the bladder; and if there is any suspicion even of the existence of a growth, such an examination should be made at once, and the result will be that much suffering will be avoided, and, perhaps, many a life saved.

The principal objection that might be urged against this method of diagnosis is the danger of producing laceration of the urethra and permanent incontinence of urine. I cannot deny that serious accidents have happened even in experienced hands, but when we know with what instruments this operation is often performed we can only wonder that more women have not been injured for life. Every conceivable instrument that is capable of stretching, from the various branched uterine dilators of Ellinger, Atlee, etc., down to even *sequestrum* and *bullet forceps*, have been

employed at one time and another as dilators for the delicate female urethra. Is it to be wondered at that the vesical sphincter is ruptured by such rude manipulation? The dilatation of the female urethra is one of the important operations in surgery, and requires, even with the most approved instrument, the exercise of every care, good judgment, gentleness and patience. Digital dilatation, a method adopted by some surgeons, is not much safer. Several cases are known to me, in which very troublesome incontinence of urine has followed this practice. In a patient of my own, the urethra was suddenly torn when every care was being taken to avoid it, and although the woman ultimately recovered, for weeks she suffered with incontinence, and I was much concerned as to whether she would ever regain the control of her sphincter.

Simon, who did so much to popularize this operation, used a series of plug-shaped specula of seven different sizes, ranging from three-fourths to two centimetres in diameter. These are introduced and withdrawn one after the other, until the required dilatation is attained. The greater safety of these plugs over the sharp edged dilators above mentioned is too apparent to need comment. But I think we have a better substitute in an instrument which I had constructed about a year and a half ago, and which has since been freely used by myself and others in this city with every satisfaction, and with absolutely no ill report from any source. Its advantages require but to be pointed out to be at once appreciated. It consists (Plate xi., Fig. 1) of a metal tube three and a half inches in length, with an obturator, elastic and conical at the point, which projects an additional inch beyond the distal end, and which serves to facilitate the introduction of the instrument. One inch from the proximal end is a handle that supports a graduated bar and thumb screw, by means of which the expansion of the instrument is effected. When closed it is thirty-nine millimetres in circumference, and is capable of

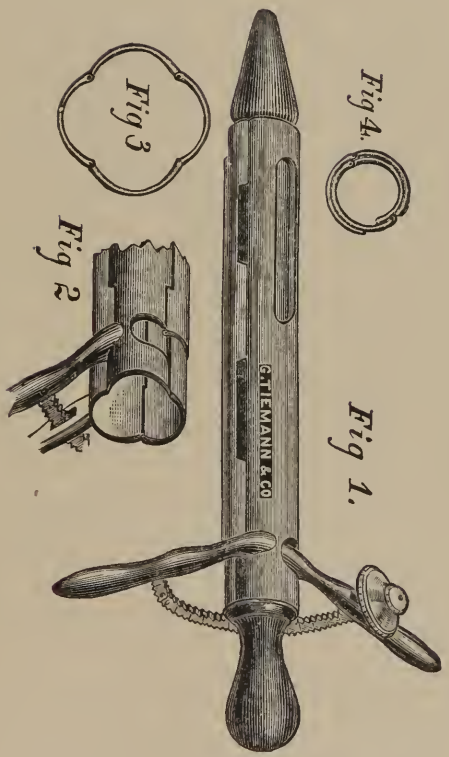
expansion to six and a half centimetres. Fig. 4 represents a vertical section of the instrument closed. At Fig. 2 it is seen expanded to fifty millimetres, and Fig. 3 shows a vertical section in complete expansion, viz., six and a half centimetres. From this it will be seen that the expansive force of the instrument is distributed as equally as possible over all parts of the circumference of the urethra by smooth rounded blades, and not upon two or three points or sides of the canal. Furthermore, the dilatation can be effected very gradually, and with absolute precision, the degree of expansion being determined by the graduated bar with the greatest accuracy, even to a millimetre.

In this manner we conform to the conditions by which alone a maximum degree of dilatation without laceration can be attained. Indeed, the tearing or rupturing of the urethra, which with other instruments is almost inevitable when thorough dilatation is effected, and the incontinence of urine which such an injury often entails, will by this, if by any method, be avoided.

Owing to the peculiar conformation of the instrument, it creates very little pain, even when dilated to its utmost capacity. I have operated in this way a number of times without using any anæsthetic. The instrument is also an admirable speculum by which a most satisfactory view of the interior of the bladder can be obtained by means of reflected light.

The following would be the method of procedure in a suspected case of tumor of the bladder. The patient being on the back or on the side, and anæsthetized, the instrument is introduced and rapidly dilated to a point at which some resistance is felt, when the dilatation is proceeded with more slowly and cautiously, the canal being stretched a few millimetres at a time, the force exerted being in inverse proportion to the resistance to be overcome, and a sufficient interval of time always allowed to elapse for the tissues to relax before further dilatation is made. In this

PLATE XI.



Author's female urethral dilator and speculum.

manner the instrument is gradually expanded to the circumference of the index finger, or if need be to its fullest capacity, which is six and a half centimetres.

It must not be forgotten that the dilatability of the female urethra varies much with the individual and with age. In some persons, the expansion can be carried to the fullest extent of the instrument, with little pain and with little delay, while in others, the rigidity of the meatus, which is the narrowest and most unyielding part of the urethra, is extreme, and the danger of laceration great. According to Simon, the highest degree of complete innocuous dilatation is 6.3 centimetres in circumference, 7 centimetres at the furthest; in girls of from 11 to 15, it is reached at a circumference of 4.7 to 5.6 centimetres; in girls of from 15 to 20, at 5.6 to 6.3 centimetres in circumference.

While this is, no doubt, the safe limit, we must know that the urethra is capable of much greater dilatation, without producing permanent incontinence. In the case of Winckel, finger and instrument had been in the bladder, the urethral mucous membrane was fissured, and yet none of the one hundred and fifty grammes of water injected after the operation escaped from the bladder. In the case of Schatz, although during the operation the urethra was dilated to an extent admitting two fingers, she could retain her water one hour after the operation, and afterwards two and three hours; from the seventh day she micturated once at night and twice during the day. There was pain only on the first day during micturition. We could cite other instances in which both indices were inserted into the bladder without any serious injury resulting.

Simon always divided the meatus with scissors before commencing dilatation, making two lateral slits of one-quarter centimetre in the upper margin, and one downwards of a half centimetre in depth. With the instru-

ment just described, I have thus far had no occasion to do this, but if the parts are at all rigid, there is no objection to slitting the meatus, while the urethra is thereby just so much shortened, and the finger can be introduced further into the bladder.

The urethra being dilated, the instrument is withdrawn, the index and middle fingers are introduced into the urethra and vagina respectively, and simultaneously carried up until arrested by the urethro-vaginal septum. By passing the middle finger into the vagina, the index can be advanced at least one centimetre further into the bladder than by the usual way of exploring. With supra-pubic pressure made with the other hand, the finger can sweep over the mucous surface and the presence of a growth, its location, size, and extent of attachment may be exactly determined. If desired, a small portion of the tumor may be detached or scraped off with the finger-nail or sharp spoon, and submitted to further examination by the microscope, or the bladder may be illuminated by reflected light thrown in through the speculum.

With regard to the question of diagnosis as between simple and malignant growths, the former do not produce the same pathogenetic changes in the surrounding mucous membrane of the bladder as do the malignant tumors; hence, there are rarely any secondary symptoms of inflammation or catarrh of the bladder (except as set up by the surgeon's unnecessary and prolonged instrumental manipulation), and at the autopsy the mucous membrane is generally found healthy. In the two cases of myoma, also, it is interesting to note the comparative absence from the urine of products of inflammation. Billroth's boy suffered for ten months with frequent and painful micturition, and yet the urine remained feebly acid, and contained but a moderate quantity of pus. Volkmann's man suffered with frequent micturition, tenesmus, hemorrhage, and strangury for six months, but had neither pus nor mucus

in his urine. The vesical trouble was entirely due to the obstructive effect produced by so large a tumor, and at the autopsy the mucous membrane was found healthy.

In villous growths especially, the intermittent character of the symptoms is a peculiar feature. The improvement which is at once manifest with the cessation of hemorrhage, and the absence of any pain or discomfort during the intervals of hemorrhage, are characteristic.

In malignant tumor, we have the existence of cancer of the uterus, prostate, or other surrounding organ, or, perchance, at some remote part of the body, to point to the disease in the bladder, or there may be a decided hereditary tendency to cancer. The touch is more certain to recognize the presence of a malignant growth, because these tumors are more frequently solid, and infiltrate the coats of the bladder. A comparison of the duration of the complaint with the character and severity of existing symptoms, will mark a more rapid progress than is observed in benign tumors.

The secondary symptoms of chronic inflammation or catarrh of the bladder are characteristic; hence, all the symptoms are more distressing and more enduring.

But, while the more aggravated the secondary symptoms the less the probability of the same being caused by other than malignant growths, these symptoms may attain such a degree of intensity as to mask the original disease, and render diagnosis difficult; especially so in the absence of the most characteristic symptom—hæmaturia—as observed in the cases above cited. But hæmaturia is exceptionally absent, and this, together with the other symptoms mentioned, the lancinating and darting pains, the glandular involvement, and the appearance of cancerous cachexia, will make the diagnosis of cancer conclusive. With reference to the appearance of cancerous cachexia, however, I should say that this is at times very deceptive. Those suffering from non-malignant tumors often present an ap-

pearance not unlike that observed in cancerous infection. In consequence of the prolonged hemorrhage, pain, disturbed rest, and impaired nutrition, the subjects become fearfully anæmic, and present an appearance which might be easily attributed to cancerous infection.

If the seat of the tumor is not accessible to the sense of touch or appreciable by instrumental contact, no fragments of tumor have passed the urethra, and the urinary sediments have afforded no clue to the existence of a foreign growth, the diagnosis must be made from the general symptoms and *per viam exclusionis*. The resemblance in symptomatology between stone and vesical growths is such that in a large proportion of cases the patients were sounded for calculus. But while irritable bladder, hæmaturia, and pain are prominent symptoms, common to both affections, they behave in a manner characteristic of each.

In stone, irritable bladder is an early and constant symptom; the hæmaturia is a later manifestation; the hemorrhage appears after exercise, and disappears with rest, and the quantity of blood in the urine is usually small. Pain is particularly felt with movement, with jolting, and after micturition, and disappears with rest in the horizontal position. The urine also soon contains mucus and pus. With tumor, irritable bladder is a later manifestation, and is sometimes entirely absent. Hæmaturia usually appears early; it is often the first and only symptom throughout. It occurs independent of movement, and is often profuse; even while at rest in bed. Pain is not occasioned or aggravated by movement or position; but sensitiveness of the urethra and pain at the glans penis is perhaps more severe than in stone; while the urine, during the intervals of hemorrhage, may be perfectly clear and free from any sign of disease. Pediculated growths often produce a sudden stoppage in the flow of urine, as is also observed in calculus; it may be that the tumor has engaged in the vesical orifice, or that the urethra has become obstructed

by a clot of blood, which being passed with some straining, the urine again flows freely.

The spongy texture of certain tumors, especially villous growths, affords an attractive surface for the deposition of phosphatic salts, which concretions, imparting the sensation of grittiness, and at times even giving the click of a calculus, have deceived surgeons into the belief of the presence of a stone. If the incrusted tumor is movable, such a mistake is still more easily made.

Duration and Prognosis.

The duration of life, after a tumor has once commenced to develop, depends upon the nature of the growth. The two principal sources of danger to life, in non-malignant tumors, is from the loss of blood, and from the effects of mechanical obstruction to the outflow of urine. When death is not caused by hæmaturia, the autopsy always reveals extensive anatomico-pathological changes in the urinary tract. Situated, as these growths so often are, over the opening of the ureters or at the vesical neck, that is, at the outlets of the kidneys and bladder respectively, they cannot fail to act obstructively to these channels, and produce, in natural sequence, hypertrophy of the bladder, dilatation of ureters, hydronephrosis, structural change in secreting substance of kidney, uræmia, and death. It may, therefore, be said that, while for simple tumors the prognosis is good, especially in women, as the growths are accessible and capable of complete extirpation; if uninterfered with, the prognosis is no better than for cancer; indeed, they may prove even more rapidly fatal by their local effects than would ensue from constitutional infection in malignant disease. Nevertheless, there is abundant evidence that simple growths may exist in the bladder for many years, during which the individual may enjoy continued health. Hudson relates a case of a man aged sixty-five, who, when fifty-four years of age, eleven years before

death, first observed his urine to be discolored, and about this time had obstruction to flow of urine; the bladder was found to be distended with blood-clot, which was broken down with a catheter and removed by the help of Clover's syringe. After the lapse of time, cystitis supervened and blood used to come away with the urine in large quantity. Nitrate of silver injections were made under chloroform at intervals for several weeks. After this, he was completely cured and continued in good health for nearly eight years. In 1875, he again had blood in his urine at intervals of three or four days. Pain and frequent micturition were his most prominent causes of complaint. Clots were rarely seen in the urine. For three months previous to death, the hæmaturia had entirely ceased, portions of phosphatic deposit were occasionally voided, appetite was fair, a suppository required only every third night, and to all appearances he was gradually improving, when he died suddenly, probably from disease of the heart. (Plate i. shows the bladder with its contained growths.)

Mr. Humphrey relates a case in which there had been recurring hemorrhage for a period of seven or eight years. During intervals of months, and once a year, the urine was quite clear and the patient suffered but little. He died after a period of excessive hemorrhage. There was a pedunculated, villous growth of the size of a walnut near the orifice of the right ureter, and a smaller sessile growth of same nature a short distance from it. Mr. Humphrey also mentions that in the museum of St. George's Hospital is a specimen of a solitary villous growth attached by a narrow base to the neck of the bladder, from a gentleman aged eighty-one. The first attack of hæmaturia, lasting eight months, was twenty years before death. There was no return for four years, after which there were returns at intervals. In another specimen, where the base of the growth is large, hemor-

rhage occurred nine years before death; there was apparently no return, and no symptoms until two months before death. In another case (Specimen 2,006, College Physicians and Surgeons, London), a quantity of blood is said to have been passed sixteen years before death. No return took place till six or seven years before death; then subsiding, recurred after three years; it again subsided to recur two years before death.

In malignant tumors, however, the course of the disease is generally more rapid and more certainly fatal; for now there is not only an additional element to contend against —the cancerous infection, but the local disease itself is much more serious. In addition to the effect which cancers have in common with simple tumors to act injuriously upon the urinary tract in opposing the free escape of urine, the former are prone to soften, ulcerate, break down, and setting up catarrhal irritation in the bladder and kidneys, soon wear out the strength and vitality of the patient. In soft cancer, the duration of life after the manifestation of the first symptom rarely exceeds one or two years. In the case of Pollock, hæmaturia occurred only six days before death, though the bladder was half filled with a fungoid mass. Other cases terminated fatally in three four, five, eight, and nine months. Dickinson discovered evidence of malignant disease in the urine in a robust, vigorous man, eight months before death. Exceptionally, the disease may last three or four years. My patient, with medullary cancer, gave a history extending over a period of seventeen years!

In epithelioma, the progress is slower. In the case of Hill, in which there was quite extensive disease, it is said that until about four months before death there were no symptoms of urinary disease. But this is a rare case; as a rule, the disease lasts from one to three years, and exceptionally five, six, eight, and nine years (Davies-Colley, Nunn, Clark, Lambl, Thompson). The long duration of some

cases of vesical cancer can only be accounted for in the supposition that malignant tumors are sometimes developed from long, pre-existing, benign growths which, having remained for a long time innocuous, or else, having already occasioned serious organic changes in the urinary tract, require but the cancerous development to run rapidly to a fatal termination. My case of medullary cancer above referred to, with a history of seventeen years, renders such a conclusion almost inevitable.

Treatment.

Tumors of the bladder have been so much looked upon as a *nole me tangere*, that it may be instructive to note what has been done and what may be done in this department of surgery. The following is a concise *résumé* of the operations that have been performed for the removal of tumors from the bladder, up to the present time. They are mentioned in a chronological order as regards females and males respectively, and will serve to show the various methods and manœuvres that have been successfully employed.

Operations Performed on Females.

1750. The first operation we can find on record for the removal of a tumor from the bladder was performed by Warner in 1750. The subject was a woman aged twenty-three. On June 24th, after lifting a great weight, she was seized with pain in the back, and afterwards, retention of urine which lasted until the 29th, when she was relieved by catheterization. Nearly three years afterward she applied to Mr. Warner and stated that she had never been able, from the moment of the accident, to void a drop of urine without the assistance of a catheter, and she had often lost blood in considerable quantities. A polypus of some size projected into, and sometimes at the external orifice of the urethra. An incision was made in the left

side of the urethra about half way to the bladder, the mass drawn forward by a thread previously passed through it, and a ligature applied to its base which was very broad. On the sixth day the tumor, which is given as the size of a turkey's egg, came away, and the patient recovered perfectly.

1823. In Howship's work on the urine, of this date, a case is related of a fungous tumor of the bladder which a French surgeon, M. Le Cat, attempted to remove. He cut into the bladder, and with his forceps pulled away and crushed several fungi at two different sittings. The woman died in two days after the second operation.

1834. Pleininger removed from a female, æt. two and three-fourth years, a strawberry-like mass which projected into the urethra. The canal was dilated and the mass removed by ligature. Further examination by rectum and by sound revealed the presence of other tumors, but no further operative attempt was made. The child became emaciated and finally died of peritonitis. Autopsy revealed numerous flocculent excrescences over the base and posterior surface of the viscus and also others of a cartilaginous consistence and of the size of an almond.

1844. Theinemann. Female, æt. forty-five, a tumor, the size of a hen's egg, with a pedicle one-third of an inch thick, was followed into the bladder by the urethra which had already been sufficiently dilated by the tumor, and a ligature was thrown around the pedicle by means of two elastic catheters and then, with a proper canula, constricted it as far within the bladder as he could reach. On the third day, the ligature was tightened, and on the sixth day the polypus fell off and the patient recovered completely.

1846. Guillon is said to have removed from the bladder of a female a pediculated growth seated at the vesical neck, by carrying a silver wire around it by means of a slightly bent catheter.

1858. Birkett applied a strong silk ligature around the

root of a polypus which protruded from the urethra of a child five years old. She was very weak, and a few days after the tumor sloughed, considerable pyrexia supervened, and she died. A number of polypi were found in the bladder.

1859. Senftleben attempted the extirpation of a sarcoma through the urethra, which had already been dilated by the tumor large enough to admit the index finger. An attempt was made to seize the base of the tumor with forceps and draw it out; this, however, did not succeed, and because of the great friability of the tumor it had to be removed piecemeal; its broad base, however, could not be so removed. The hemorrhage was very insignificant. Patient died on the fourth day after the operation from purulent peritonitis. On examination there was found on the right side of the fundus a perforation large enough to admit the index finger; this was made during the attempt at extirpation.

1864. Bryant, in the *British Medical Journal*, May, 1879, says that, fifteen years before, he removed a growth from the bladder of a female with the écraseur, and the patient was still quite well eight years afterwards.

1864. Morris, in the same journal, refers to a female, æt. fifty-six, from whom he took away a large growth with the écraseur; all the immediate symptoms were relieved, though she died eventually of hydronephrosis.

1868. May. Braxton Hicks. Female, æt. sixty. The urethra was dilated; the finger passed, and a cauliflower-like mass, the size of a small orange, was found attached to the posterior wall of the bladder, as much of the mass as could with safety be removed was taken away by the forceps, and with the wire-rope écraseur. This had the effect of restraining the bleeding and other symptoms. Six months afterwards, however, the bladder became more irritable and the urine bloody; the urethra was again dilated and

the tumor found not to have recovered its original size; a strong solution of tannin was applied with benefit.

1868. June. Guerssant. Female child, æt. twenty-two months. A small tumor, like a nut, projected from the urethra, it was seized, drawn forwards, and a metallic thread was passed as far as possible round the neck of it, after gaining access to it by dividing the urethra with the scissors. The thread was gradually and slowly tightened by a serre-nœud, but broke before the tumor was separated, so the operation had to be finished by the écraseur. The child gradually lost strength, and though the bladder symptoms improved, the soft parts became inflamed and there was sloughing. Diarrhœa supervened, and she died exhausted on the eighth day.

1869. A. R. Jackson. Female, æt. forty. Fibrous polypus. December, 1869. A sponge-tent was introduced and left in four hours, after which, the finger being introduced, a tolerably dense mass with a smooth surface was felt occupying the lower part of the bladder and pressing against and somewhat into the vesical orifice of the urethra. A larger tent was introduced and the husband instructed to remove it in four hours, and should tumor again appear to secure it against return. On withdrawal of the tent, the tumor appeared, it was seized with the forceps and fingers, but in making traction it broke off in the urethra. The portion removed was a fleshy-looking mass about the thickness and nearly the length of a finger. Two days after, the tent was again introduced, the tumor appeared at the urethral orifice, it was grasped and drawn out about two inches and by twisting it like a rope, a portion of growth eight inches long and of the thickness of the thumb was removed. Very little bleeding attended the operation. Several fragments came away during four or five days succeeding. April 30th, 1870, patient fully regained general health and the incontinence from which she had been suffering since the operation was improving. (The

incontinence was no doubt occasioned by the slow method which was adopted in dilating the urethra.)

1869. Simon. Female, æt. seventy; urethra dilated, finger discovered a pediculated villous growth behind the urethra, the most accessible portion of the tumor was seized and twisted off by forceps, while its infiltrated base was scooped out with a sharp spoon. The reaction was insignificant, although the lesion to the vesical mucous membrane must have been considerable. Patient left the bed on the fourth day and remained perfectly well five years afterward.

1869. Winckel. Female, æt. thirty-nine. Urethra dilated with index of left hand, near the orifice of right ureter was felt a large movable soft villous growth, small pieces of which were detached by the movements of the finger. After this, the bladder was injected with about one hundred and fifty grammes of warm water, and by means of the finger and forceps all appreciable prominences were removed from the posterior wall of the bladder. The sphincter contracted in such a manner that after withdrawal of the finger none of the injected fluid escaped. Patient made a complete recovery; saw her two years after the operation and there was no sign of a relapse.

1872. C. S. Bishop (related by Gross, Surgery, second edition). Female, æt. fifty-six; removed a cylindrical vascular polyp nearly three inches long; it had a globalar head eight lines in diameter, and was attached by a narrow pedicle to the bas fond of the bladder. Finding a portion of tumor projecting from meatus, he ligated it. The next day applied a silver wire around its neck, and at the expiration of forty-eight hours he removed the mass by rotating a double canula upon its axis.

1874. Simon. Female, æt. 40; had urethra dilated several times, and small portions of tumor twisted off by forceps. Two years after first discovery of tumor, patient

came to Simon, who, April 14th, dilated the urethra, and found that two-thirds of the bladder was occupied by a tumor. With a sharp spoon he scooped out and removed a large portion of the growth. In the course of about an hour and a half, the spoon was introduced into the bladder about twenty times, and the scraping made under the guidance of the finger. Patient had only a little pain after the operation and perfect continence of urine. The bladder was washed out with luke-warm water daily. The urine soon acquired an acid reaction, and in five days patient left the bed. On April 28th, the operation was repeated, and again considerable portion of tumor removed. Eight weeks after the first operation, when the patient left the hospital, there were no papillary prominences apparent to the touch, but at the place where the tumor had been, there was felt an uneven, rather hard surface, covered with mucous membrane. The urine was acid; the bladder pains had disappeared; could hold water five hours, and the general condition of the patient was excellent. This case is especially interesting as showing what can be done even with very large and sessile tumors of the bladder.

1874. Simon. Female, æt. 44. July; urethra dilated; all over the internal surface of bladder, as far as finger could reach, there were warty or papillary projections. A sharp spoon was introduced, and as much as possible of the new-formation removed. The patient was quite well after the operation, and in the middle of August the symptoms were much better. But, he adds, the next time she will have to submit to an operation through the vesico-vaginal septum.

1873 to 1876. Schatz. Female, æt. 18. The posterior three-fourths of the urethra was found dilated to the diameter of the finger, by the projection from the bladder of a tumor the size of a goose's egg. The tumor had its origin by a pedicle of about four centimetres in thickness from the right antero-lateral wall, one to two centimetres

above sphincter. So much of the tumor as could be reached was removed by the écraseur, and the remainder separated in smaller portions by means of the finger. Patient recovered, and had no trouble for about a year. In August, 1874, she returned with about the same symptoms as at first, and the operation with the écraseur was repeated. She was up in a few days. December, 1875, gave birth to a child. January 10th, 1876, found that the tumor had not grown much beyond the size of a hazel-nut. January 20th, incised the right side of the urethra, and inverted the posterior wall of the bladder with the tumor through the urethra by means of several threads previously passed through the tumor from the vagina, and after cutting out the growth in two portions, united the edges of the wound with ten silk sutures. Although during the operation the urethra was dilated to the extent admitting two fingers, the patient retained her water one hour after the operation, and, afterwards, two and three hours; from the seventh day she micturated once at night and twice during the day. There was pain only on the first day during micturition. The patient recovered rapidly. Microscopic examination found the tumor to be a benign myxoma.

1876 to 1878. Wm. Alexander. Female, æt. 44. The urethra was in such relaxed condition that the finger could be inserted into the bladder without the infliction of much pain. The floor of the viscus was extremely rough and irregular. These irregularities were of various heights; a few were as much as a quarter of an inch from base to apex, and one seemed to be nearly an inch in height. This large one, on the left side of the bladder, had a rounded, enlarged apex; the apices of the others were thin and pointed. July, 1876, the urethra was dilated with an anal speculum; the wire of an écraseur was passed around the base of the largest growth, and the same cut through; in trying to get it out, others were displaced from their place

of growth by the movements of the finger, and all nodules that could be felt were scraped off with the finger-nail, and the bladder washed out with a weak solution of perchloride of iron. There was not an excessive amount of hemorrhage during the operation, but the urine contained a good deal of blood for the first week. She had incontinence of urine for two days only, during which scraps of the tumor came away. There were about two dozen small growths removed, and five or six growths were lost. The patient soon resumed her work as cook in a very good condition. In October, 1877, she had a relapse. Numerous soft growths were felt upon and beyond the trigone; about a dozen small arborescent growths were easily removed by the finger-nail, and several small growths came away the same evening. October 19th, urine was perfectly clear; pain on micturition was almost gone; health was good, and system well nourished. May, 1878, again removed a large mass of growths. Recovery was more rapid and more perfect than on either of the previous occasions, and the urine has continued clear ever since, August 17th, 1878.

1879. Christopher Heath. Female, æt. 39. Urethra was dilated with a four-bladed dilator and the finger. Right side of bladder was occupied by a villous growth, situated on a hardened base. Some of the growth was torn away (villous sarcoma). Patient died May 25th, from general exhaustion.

1879. Godson. Female, æt. sixty. A polypus the size of a walnut was found protruding from the urethra and connected with a narrow pedicle with the fundus of the bladder, which viscus was partially inverted. Catgut ligature was applied and the tumor separated with scissors.

1879. Incision Urethro-Vaginal Septum. A. T. Norton. Female, æt. thirty, January 3d, 1879. Dilated urethra with the finger and discovered a papilloma, in size about one square inch and coated with phosphates, not much raised above the mucous surface, but very hard, and situated on

the trigone about half an inch from the sphincter. It was impossible to remove the growth through the urethra. The spring scissors were inserted, one blade into the bladder nearly up to the tumor and the other into the vagina, and closed; the front wall of the vagina was then incised centrally to within half an inch of the uterus. The vagina which was not incorporated in the growth was dissected from the bladder, the growth was seized with the vulsellum forceps, drawn forwards, and excised with the scissors. Bleeding was arrested by the actual cautery and the lateral flaps of the vagina were approximated by sutures. No hemorrhage of importance took place. The temperature remained below normal and the pulse rose to one hundred and twenty. Severe vomiting was persistent until the tenth day after the operation. After the tenth day, she was considered out of danger, was making good progress, took food well, and was cheerful. On the twelfth day, when apparently in health, she vomited, and shortly afterward fell asleep, in which sleep she died from syncope at a time when she was recovering from the operation.

1879. Mr. Norton says that soon after the above experience he had an opportunity of operating a second time, in a similar manner, without any untoward symptom. Tumor was situated on the front wall of the bladder; it was one inch long, one-half inch wide, and three-quarter inch above the level of the mucous membrane. It did not infiltrate the tissues of the bladder. Structure, fringed papilloma. The opening in the bladder was allowed to remain for a month and then it was closed by the ordinary method.

Operations Performed on Males.

1827. Civiale, while manipulating with his trilabe with a view of removing a calculus from the bladder, accidentally tore away a soft, pedunculated mass about the size of a pea. This accident at first gave him some uneasiness as to the possible result; but no untoward symptom

appearing, he conceived the idea of having recourse to this manœuvre for the removal of small growths at the neck of the bladder, which he put into successful practice in several cases. In a man aged seventy, he used the trilabe three times, at intervals of some days, each time taking away a small portion until he had removed a mass the size of a large walnut. The man died three months afterward from typhoid fever. The method of operating, as recommended by Civiale, consists in opening the instrument in the bladder, drawing it forward as far as possible so that the blades of the same lie in contact with the vesical neck, when by turning the instrument from side to side the excrescences fall between its blades and are crushed. In a few days the necrosed portion is carried off with the urine.

Covillard (Obs. Iatro-chir. p. 93, mentioned by Crosse) performed cystotomy for a tumor in the bladder the size of a nut. "Je la mouchait avec les tenettes, ceque reussit de sorte qu'en moins de huit ou dix jours, la dite tumeur termina par suppuration," and in a month the patient was convalescent.

1830. Perineal Cystotomy. Dessault. Chopart mentions a man at the l'Hôtel Dieu, from whom D. extracted a calculus, and afterwards finding a pediculated growth, he seized it and twisted it off. There was no hemorrhage, and the patient left the hospital perfectly cured.

1834. Crosse performed perineal cystotomy for the removal of a villous growth, upon a male child two years old. On removing the knife after the necessary incisions were made, a mass of tumors, connected together like a bunch of grapes, and resembling in appearance and structure ordinary nasal polypi, protruded through the wound; as many of these as were accessible were cut off, but upon introducing the finger into the bladder, it was found that much of the diseased mass remained attached by a broad base, and it was not deemed advisable to make any further

attempt for its removal. After forty-four hours of incessant suffering, the child died.

1871. Gersuny attempted to remove a tumor from a man aged forty-nine, by perineal cystotomy, but the growth was beyond reach in a diverticulum, and the operation failed. The day following, the patient felt better than before the operation, and afterward made no complaint of any kind, but refusing all nourishment, he gradually became exhausted, and died after the sixth day.

1874. Perineal and Supra-pubic Cystotomy. Billroth. Boy, æt. twelve. Lateral incision was made; finger introduced into bladder, and a tumor found nearly the size of the fist, with an uneven surface projecting from the posterior wall and extending towards the top of the bladder. Owing to its size, it was impossible to extract tumor through the perinæum. A supra-pubic incision was made without injury to peritonæum, and to give sufficient room both recti muscles were cut across at their insertion; a transverse incision was also made into the bladder. Billroth found that the use of the écraseur was not practicable, and decided to tear the tumor with his finger-nail near its base, and to cut out the remainder from the wall of the bladder, after passing a ligature around to check the bleeding. In dissecting out the pedicle, it was found that the tumor took its origin from the muscular coat. Two arteries were tied, and the ligatures brought out through the upper incision. The wound in the bladder was not closed, but a drainage tube was drawn through the bladder and brought out at the perineal incision. On the fifth day, the wound was granulating freely, and there being no more danger of infiltration, the drainage-tube was removed. In thirty-four days, the wound had closed, and the patient was discharged cured. Tumor is seen at Plate ix.

1874. Perineal and Epicystotomy. Volkmann. Male, æt. fifty-four. Membranous urethra was opened on the raphé

of the perinæum, and the finger passed into the bladder. A tumor was found, of the consistence of a uterine polypus, and about the size of a lemon, attached by a pedicle to vertex of bladder. Epicystotomy was now made, the bladder being opened by incision one and one-quarter to one and one-half inches long, made on the finger, passed through the perineal wound. Peritonæum not visible; the tumor appeared at once, its surface covered with dilated veins, and on scratching through the pedicle, which was of the size of the little finger, the growth was removed by traction with forceps, assisted by pressure from the rectum. The wound in the bladder and abdominal walls, after washing with carbolized water, were closed with sutures; the whole abdomen enveloped in carbolized gauze, and a drainage-tube placed in the perineal wound. The following day, abdomen became tender; peritonitis developed, and death ensued on the third day after operation. Autopsy revealed peritonitis, diffuse purulent infiltration of subserous areolar tissue of abdominal wall; muscular coat of bladder moderately hypertrophied; mucous membrane swollen, showing a number of old and recent ecchymoses, but otherwise healthy. At the situation of the pedicle, which is four lines long, the muscular coat is exposed on the posterior wall. Volkmann believes the extravasations of blood to have been caused by the rectal explorations. No sign of inflammation about the incisions. The size and form of the tumor is represented at Plate x.

1874. Kocher. Male, æt. thirty-four. Began to suffer in the spring of 1874, with a constant desire to micturate and incontinence. In June, these symptoms changed to a violent burning pain and increased desire to pass water. Urine of intolerable odor, and contains blood and pus. A piece of tumor which came out proved to be a papillary growth. December 31st, urethra was opened by a T-shaped incision. A vertical cut in the mesial line and a

horizontal one, after Nélaton's pre-rectal method. The urethra was opened on a grooved staff and the finger introduced into the bladder. On its posterior wall was felt the soft, tufted, fungoid mass of the new-growth; a large sharp scoop, bent at an angle, was introduced against the finger, whereby it was forcibly scraped off. The hemorrhage was pretty severe, but was arrested by cold water injections. No dressing was applied. The wound healed in six weeks, and in fifteen months the patient was considered as quite cured.

1877. Humphry. Male, æt. twenty-one. A mass could be felt in the bladder above and behind the pubes. Suffering being extreme, made an incision into the bladder as for lateral lithotomy, and found a firmish tumor, with a ragged surface, attached by a pedicle to near the orifice of right ureter. Partly by finger and partly by forceps, the pedicle was torn through, and the tumor was extracted with lithotomy forceps. The root of the pedicle was scraped out with the finger-nail. After a day of comparative ease, the pain returned with great severity, requiring the subcutaneous injections of morphia, which had to be increased to large doses, and continued for more than two months. Then the pain diminished and gradually subsided. The wound healed, and the patient completely recovered, and was quite well eighteen months after the operation.

1880. Davies-Colley. Male, æt. thirty-two. Opened the bladder by the usual incision for lateral lithotomy. At first nothing could be felt. Then a slight projection was made out on the left side of the fundus, and a cord-like process running from it. In a short time the free end of this process, with a soft pinkish tuft of villi attached to it, was seen at the deeper part of the wound. This was seized with the forceps, drawn out, and the pedicle cut with a pair of scissors close to the wall of the bladder. No other growth could be felt. There was but little

hemorrhage during the operation, and some which occurred in the evening was readily arrested by the injection of iced water into the bladder. He made a rapid recovery. In two weeks, the urine ceased to flow from the perinæum, and soon afterwards the wound healed. When last seen, two months after the operation, there had been no return of the hemorrhage. The irritability of the bladder had ceased, and he was in the enjoyment of perfect health. The tumor grew from the posterior wall of the bladder, at a point about three inches from its neck, and one inch to the left of the middle line. It consisted of a fibrous stalk, one-sixth of an inch thick and two inches long, and terminated by branching filaments from half an inch to three-quarters of an inch long. These filaments contained capillary loops, invested by many layers of epithelium of a cylindrical shape.

1880. Supra-pubic Cystotomy. Marcacci. Male, æt. fifty-four. An incision thirteen centimetres in length was made, commencing one centimetre above the upper margin of the symphysis pubis, and extending through the linea alba. The bladder was found to be enormously distended, its whole interior being filled with a large neoplastic mass; this was removed. The wound in the bladder was brought together with four catgut sutures; that in the abdomen with interrupted metallic sutures, and the whole dressed antiseptically. The patient progressed favorably during the first ten days, when, on the removal of the metallic sutures, the wound being apparently healed, a few drops of urine escaped from the openings where the sutures had been. All attempts to cure these urinary fistulæ failed. Patient died within two months after the operation from extravasation of urine, pelvic abscess, and peritonitis. M. considers that the cause of death was due to the too early absorption and destruction of the catgut sutures, which probably lost their holding power before the wound in the bladder had become consolidated.

1880. Berkeley Hill. Male, æt. sixty-three. Not with any expectation of effecting a cure, but of affording relief, the lateral incision as for stone was made, the finger introduced, and a soft mass, about as large as a marble, projecting from the floor of the bladder on the right side, was brought away in a lithotomy forceps. By free injections of cold water, several such masses were washed out along with much stinking pus and mucus. The patient was but little relieved by the operation, and death occurred on the third day from exhaustion, consequent on the irritation of bladder and from cachexia of a malignant tumor, which was found in the bladder after death.

Perhaps not altogether irrevelant to the operations above recorded is one performed by Liston (related by Robt. Knox, M.D., *Lon. Med. Times and Gaz.*, August 2d, 1862), for the removal of a cyst from the bladder of a man suffering with difficulty in discharging his urine. Liston passed a catheter and felt a soft, yielding but obstructing body in the prostatic portion of the urethra. This readily gave way before the catheter, which then passed into the bladder, but on being withdrawn it was followed by the foreign body, which immediately reoccupied its former position. Liston opened the bladder above the pubes, and as the incision was made, there escaped from the bladder a body resembling a cyst or false membrane of the shape of the interior of the bladder. The wound was closed, the patient recovered and lived for some time.

From the foregoing we learn that thirty-four operations have been performed for the removal of tumors from the bladder: twenty-three upon females and eleven upon males.

In seventeen of the former, the growths were removed through the urethra by previous bloodless dilatation of the canal, and in six by incision of the urethra or of the vesico-vaginal septum. The subjects varied in age from twenty-two months, two and three-quarter and five years

to seventy years. The growths removed have included papillomata, myxomata, myomata, and sarcomata. The tumors have been removed by simple torsion and avulsion, by ligature, silk, and catgut, silver wire, by écraseur and by scooping out with a sharp spoon. Excepting the method of scooping, in which the hemorrhage is sometimes considerable, the loss of blood in the other operations was insignificant. Of the seventeen patients from whom the growths were removed by urethral dilatation, ten recovered. In this number we include the cases of Guillon, Bishop, and Godson, in which, although the result is not absolutely stated, the phraseology is such that there can be little doubt as to their successful termination. Two cases are reported as much improved by the operation and five terminated fatally. After the six cutting operations, three recovered and three died. We thus find, after both operations, a total of thirteen recovered, two improved and eight died.

Let us now examine to what degree, in the fatal cases, the operations may be regarded as having been the immediate cause of death. In the patient of Le Cat we have no data other than that she died in two days after the second operation. In Heath's case, a portion of sarcoma was torn away and the patient died a *month* after, from general exhaustion. In the case of Morris, the patient *improved* by the operation, but died eventually, he does not say when, evidently at some remote period, from hydronephrosis. In Guerssant's child, aged twenty-two months, the bladder symptoms *improved*, but the child weakened, had diarrhœa, and died exhausted on the eighth day. Norton's patient died on the twelfth day when apparently in health; she vomited, and shortly afterwards fell asleep in which sleep she died from syncope at the time when she was recovering from the operation.

In these four cases, certainly it cannot be said that the operation caused or precipitated the fatal termination.

Neither is this at all evident in the patients of Pleininger and Birkett; both of those were children, aged respectively two and three-quarters and five years. The first little sufferer remained unrelieved by the operation, because numerous growths were left behind. "She became emaciated and finally died of peritonitis." It does not appear how soon after the operation death ensued, but from the language we may reasonably infer that the peritonitis had no connection with the operation. The other patient was a very weakly child, and a few days after the tumor came away, considerable pyrexia supervened and she died. It may, therefore, be said that in but one of the eight fatal cases in the female can the operation be positively held as the immediate cause of death. In this case (Senftleben), the bladder was perforated during the attempted removal of a sarcoma, and the patient died on the fourth day from purulent peritonitis.

With regard to the size and character of the growths that may be successfully removed through the urethra, some are given as the size of a goose's egg, turkey's egg, etc., which have been removed by ligature, écraseur, etc. But the most noteworthy operation, as showing what can be done even in the least promising of cases, is that of Simon, who successfully scooped out from the walls of the bladder a sessile tumor that had occupied two-thirds of the cavity of that viscus.

The male bladder has been opened for the removal of tumors eleven times: eight times through the perinæum, including in this enumeration Covillard's operation, about the precise nature of which, however, we have no data; twice jointly through the perinæum and above the pubes, and once above the pubes only (not including Liston's successful removal of a cyst). Of these eleven operations, six proved successful and five fatal. Of the successful cases, five recovered after perineal cystotomy and one after both perineal and supra-pubic cystotomy. Of the

deaths, three occurred after perineal cystotomy, one after both perineal and supra-pubic cystotomy, and one after supra-pubic cystotomy. The ages of the subjects operated upon varied from two to sixty-three years.

These statistics would show apparently a mortality of nearly fifty per cent, but a more careful examination will show that such a percentage of deaths is probably much in excess of what may be expected. In the first place, the case of Hill cannot be included in the results, as militating against the operation, for this was not done with any idea of effecting a cure, but simply as a palliative measure, with the hope of affording temporary relief from intense suffering due to malignant disease in a subject sixty-three years old, already worn out and cachectic. The case of Gersuny was very exceptional in that the tumor was inclosed in a diverticulum of the bladder and was altogether beyond reach. Besides, the tumor had been of so long standing that it had given rise to other serious changes in the vesical walls, which, even in the event of the successful removal of the tumor, would have rendered recovery impossible (see Plate iv., Fig. 1). In the child of Crosse, the growths were but partially removed, hence recovery could not have been expected. In the cases of Volkmann and Marcacci, the cause of death was the imperfect closure of the vesical wound. In both, the wound in the bladder and abdomen was closed with sutures. In the first case, death occurred on the third day from peritonitis and diffuse purulent infiltration of subserous areolar tissue. In the latter, the vesical wound was brought together with catgut ligatures, and the abdominal wound with metallic sutures. Patient did well at first, but died within two months from extravasation of urine, pelvic abscess and peritonitis, because, as Marcacci thinks, of the too early absorption and destruction of the catgut sutures, which probably lost their holding power before the union of the wound in the bladder had become firmly established. The

question might here be asked, if, when the imperfect closure of the bladder was first manifest by the appearance of the supra-pubic urinary fistulæ, the fatal complications might not have been averted had the bladder been opened in perinæum.

In this connection, it may also be noted that a number of post-mortem examinations indicate that the cases of successful removal of tumors from the bladder might have been multiplied by an early operation. In some cases, the bladder has been actually opened and yet no attempts were made for the removal of an existing tumor. Perhaps the earliest example of this is recorded of Petit, of whom it is said that, although he did not remove the polypus, the operation of opening the bladder was not attended with any bad result, and a year afterwards, on post-mortem examination, it was discovered that there was a polypus the size of a *fist* in the bladder, of a pyramidal figure and attached by a *very delicate* pedicle. Although this man, aged twenty-eight, is said to have died of phthisis, there is probably little doubt that his life would have been prolonged by the removal of the growth which apparently could have been most easily accomplished. Gross alludes to two operations for stone, one Deschamp's, the other his own, in which the calculi were extracted, but the neoplasms which were afterwards found were not interfered with. He does not say why, but speaks of his own case as a tumor situated on the anterior wall of the bladder, lobulated and sessile. From a reference to the histories and drawings given of several of our cases, such as those of Springall, Barton and Hudson, in which for some reasons no operation was attempted, it will be seen that the removal of the growths could have been most easily accomplished, and, as it would seem, with every prospect of success.

The foregoing citation of the various methods adopted for the removal of tumors from the bladder leaves

little more to be said in regard to treatment. The choice of an operation, however, will depend upon the seat, nature, and size of the growth. In the female, owing to the shortness and dilatability of the urethra, tumors may be removed by this channel with comparative ease and safety. The urethra being dilated in the manner already laid down, the left index introduced and the tumor recognized, a long, slender pair of forceps or scissors may be guided along the finger to the pedicle of the growth, and the same twisted off or cut away. Fig. 1 represents the forceps used by Simon for this purpose. They are very long, S-shaped (A), and their branches are scissors-like, either toothed (*b*), or with a smooth edge (*c*). If the tumor is not removed in this way, it may be treated by écrasement, or ligature, as may be deemed most expedient. Sessile or flat growths may be extirpated by the knife, or by means of sharp spoons especially constructed for the purpose. The instrument so successfully employed by Simon is depicted at Fig. 2. It is long handled; A, the edge, is very sharp, and the spoon is bent at a right angle to the handle, *b* and *c*. The growth is scraped or cut away by pressing the part to be taken off against the edge of the spoon with the finger. This operation is always attended with pretty free hemorrhage; but this may be kept under control by means of iced water, injected

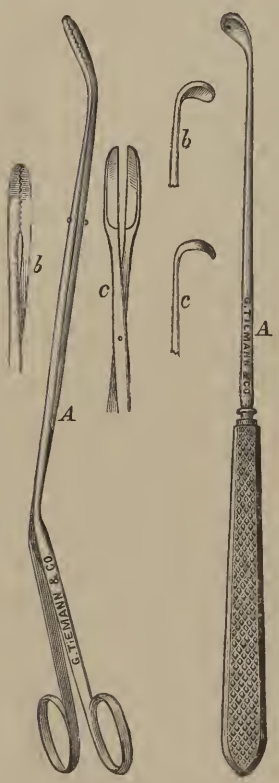


FIG. 1. FIG. 2.

into the bladder, or the application of a pledget of lint soaked in perchloride of iron to the base of the tumor, and the bladder afterwards washed.

If the tumor is not accessible, or is too large to admit of removal after bloodless dilatation of the urethra, the canal may be further enlarged and shortened by incision. This was done successfully, as we have seen, by Warner, who divided the left wall of the urethra half-way to the bladder, and also by Schatz, who incised the right side of the urethra and inverted the posterior wall of the bladder with the tumor through the urethra by means of several threads previously passed through the tumor from the vagina.

If lateral incision of the urethra is not made, the tumor may be reached by kolpo-cystotomy. In regard to this operation, Simon recommends that the incision through the vagino-vesical septum should be T-shaped. He says that by a long incision through the whole length of the urethra to the mouth of the uterus the bladder cannot at all, or but very little be introverted. The inversion of the vertex and the upper part of the fundus, however, is obtained after a transverse incision of three centimetres in length into the anterior wall of the vagina, one-quarter to one-half centimetres in front of the anterior lip of the os uteri; and, still better, when, besides the transverse incision, a second one is made at right angles directly toward the urethra, so that a T-shaped incision results. By the exercise of some traction in the direction of the vagina with a fine double hook inserted into the mucous lining of the bladder, and a simultaneous pressure over the hypogastrium, the interior of the bladder is made so completely accessible by inversion, that the most complicated and most difficult operation can be performed with the same facility as on the surface of the body. The tumors may be extirpated with scissors, knife, and even the galvano-cautery can be used. After the internal wound

has cicatrized, the vesico-vaginal incision may be closed by the usual method.

In the male, the tumor may be reached either through the perinæum or from above the pubic symphysis. It would scarcely be to the purpose now to institute a close inquiry into the relative advantages and disadvantages respectively of suprapubic and perineal cystotomy. For the removal of tumors of the bladder, the selection of an operation can rarely be a matter of choice, but must depend upon the location, mode of attachment, and size of the growth. The perineal operation will, perhaps, be more frequently adopted; 1, because of the usual seat of tumors in the lower portion of the bladder, which, in the absence of great hypertrophy of the prostate, are generally sufficiently accessible from this point, and, especially if pediculated, are easily enough removed; 2, because the operation itself is considered less hazardous than is the opening of the bladder from above; 3, because, if after perineal cystotomy the tumor proves to be inaccessible or too large to be thus removed, and suprapubic cystotomy is found necessary to reach it, the perineal incision will not diminish, but rather increase the chances of recovery, by affording free drainage for the urine in the most depending position. It is said of Frère Côme (1758–1778), whose high operations for stone were so successful that, in order to prevent urinary infiltration, he was in the habit, before performing epicystotomy, of opening the urethra in perinæum. The value of perineal drainage was also appreciated by Civiale, who, according to Bransby Cooper (Coulson, p. 476), while engaged in the high operation for stone, accidentally wounded the peritonæum, and fearing extravasation of urine into the peritoneal cavity, opened the bladder through the perinæum, and the patient recovered. In Billroth's case, the preliminary perineal incision proved eminently satisfactory.

Sometimes, however, the most available method of reaching the tumor will be from above the pubes. In addition to the freedom from hemorrhage, absence of danger of wounding the rectum and ejaculatory ducts, etc., statistics show that for calculi above two ounces in weight the results after the high operation are more favorable than after lateral lithotomy—a fact which has an important practical bearing on the possibilities of success in the removal of tumors by the supra-pubic method. But without further dwelling upon the relative advantages of the two operations, the fact, that in the high operation the parts are freely exposed to view, is an advantage which must, in certain difficult cases, supersede every other consideration.

Preparatory to the operation, the supra-pubic region is to be shaved, the bladder, after being evacuated of urine, is distended with, perhaps, a one-quarter per cent solution of carbolic acid, and if necessary or desirable, the bladder may be still further raised above the pubes by distending the rectum with a colpeurynter or a few sponges. The patient is placed in the recumbent posture, with the pelvis elevated above the level of the loins and shoulders, so that the abdominal viscera shall gravitate away from the bladder. The surgeon, standing to the left of the patient, makes an incision from three to four inches in length, commencing immediately over the pubes, upwards in the mesial line and down to the aponeurosis of the abdominal muscles. The linea alba being exposed, this structure is divided at the upper border of the pubes, sufficiently to admit a grooved director upon which the linea alba and fascia transversalis are slit up to the requisite extent, perhaps one and a half or two inches. The bladder will now be felt at the bottom of the wound as a soft fluctuating tumor, still covered, however, by areolar tissue, which may be divided with a few touches of the knife or separated with the handle of the scalpel; but the areolar tissue con-

nection between the bladder and symphysis should be left as much as possible intact, because it forms the best barrier against the infiltration of urine or pus. The bladder being now fairly exposed, it should be secured by ligature or transfixed by a tenaculum before it is opened; otherwise, when the incision is made it will collapse out of sight and embarrass the surgeon in the succeeding steps of the operation. The bladder being held in position, a vertical incision is made, the margins of the vesical wound held apart while the tumor is drawn out if possible, and removed either by avulsion, écraseur, knife, or galvano-cautery. The incision in the bladder should be as small as possible, but always clean cut and free enough for easy access to the growth, as stretching of the wound implies more or less bruising or laceration which, when the edges are brought together, will correspondingly interfere with the union by first intention. If the external longitudinal incision affords too limited a field for operation, the wound may be enlarged by two small, transverse cuts immediately above the pubes, without separating entirely the insertion of the recti muscles. Billroth, in order to obtain sufficient room, was obliged to divide both recti at their insertion. But this is to be avoided, if possible, because such wounds require a longer time to heal and are apt to lead to the formation of abdominal hernia.

The dangers apprehended from supra-pubic cystotomy are, wounding the peritonæum, and urinary infiltration of connective tissue. The danger of wounding the peritonæum is not so great as is generally supposed. Out of 478 cases of supra-pubic lithotomy collected by Dr. Dulles (*Amer. Jour. Med. Sc.*, July, 1875), in only 13 had this membrane been wounded and of these 3 cases were fatal. Even for the removal of large tumors, the bladder can be so distended as to present above the pubes, and opened without endangering the peritonæum. Garson (*Edin. Med. Journ.*, Oct., 1878) has shown that the bladder can be as easily raised

above the symphysis by distending the rectum as by injecting the bladder, and that, in case where it is not advisable to distend the bladder to a large size, distention of the rectum by a colpeurynter is all that is required to make the parts suitable for the operation. Petersen, of Kiel, by numerous experiments, substantiates these observations, and finds that, with the bladder and rectum moderately distended, the line of reduplication of the peritonæum, as shown by measurements on the cadaver, is thus displaced upward to the distance of about five and one-half centimetres, and can thus be kept out of the way of injury. In children, it will be remembered the bladder is almost an abdominal viscus; but if it is desirable to distend the rectum, this can be done with one or two sponges, previously attached to a string, to prevent them from passing beyond reach.

With reference to the question of urinary infiltration, this is a danger to be apprehended as well after perineal as after supra-pubic cystotomy; but the danger of septic infection is, perhaps, less after epicystic infiltration, because it is less confined and more accessible to our interference than when the urine has infiltrated the peri-prostatic and cirumrectal areolar tissue.

The prevention of urinary infiltration involves the consideration as to the best way of dealing with the vesical wound. Shall it be stitched or shall it be left open? Both methods have their strong advocates, and both have shown excellent results. If we turn to our present experience in epicystotomy for the removal of tumors, we find, on the one hand, the success of Billroth, by the open method, and, on the other hand, the failures of Volkmann and Marcacci, by the closed method. Although Volkmann operated in a manner similar to Billroth in making the preliminary perineal incision, in his case, as in Marcacci's, purulent infiltration and peritonitis occurred from, as it is said, imperfect closure of the vesical wound.

Prof. Trendelenburg, Rostock (*Berlin. Klin. Wochenschr.*, No. 1, 81), reports four successful cases of supra-pubic lithotomy, which he treated by the open method with *abdominal decubitus*. At the completion of the operation, he washes out thoroughly the wound and the bladder with carbolic solution, and then relies altogether on the efficacy of drainage, which he secures by inserting through the wound and into the bladder a T-shaped drainage tube, its peculiar shape preventing its falling out, and employing the *abdominal decubitus* on air cushions. He considers infiltration of urine impossible under this management.

On the other hand, excellent results have been attained after the high operation for stone with stitching of the vesical wound. Although we have been unable to obtain statistics, our German brethren, especially, appear just now to have a predilection for this particular procedure, and we have every reason to expect that with good depending drainage and thorough Listerism, many a good result will follow the same operation for the removal of tumors. The time, however, has not yet come when it would be judicious to express a positive opinion as to the safest method of dealing with the vesical wound; we must await further experience. But it will, no doubt, be impracticable to adopt a uniform practice in all cases. Among other things, we shall have to be governed much by the condition of the vesical walls. In one of my own cases, for instance, the vertex of the bladder had become so attenuated by distention from blood-clots that, had the viscus been opened from above, a perfectly water-tight closure of the wound by sutures could not, I am convinced, have been accomplished.

As an absolute water-tight closure of the vesical wound is a *conditio sine qua non*, to union by first intention, as soon as the sutures are applied, the bladder should be moderately distended with water to see that this has been accomplished.

With the view of preventing urinary infiltration, Vidal de Cassis suggested dividing the supra-pubic cystotomy into two separate operations: the first to consist in making the abdominal section down to the bladder, and some days after the establishment of surrounding adhesive inflammation, to open the bladder. Nélaton is said to have once operated in this manner, but the patient, seventy-eight years old, had so much pain that the bladder had to be opened on the third day. I cannot find that this peculiar method has since been repeated.

T. Gaillard Thomas has very recently made a success of clamping the lips of the vesical incision between those of the abdominal wound, and it may be that we have by this method the prospect of better results than those hitherto obtained by sewing up the opening and returning the repaired viscus to the pelvic cavity. This new procedure was effected on the occasion of a laparotomy, performed on a lady, aged thirty-eight, for the removal of a large multilocular ovarian cyst. The abdominal walls being laid open to the extent of about three and one-half inches in the median line, Thomas found the bladder greatly expanded over, and extensively attached to the anterior surface of the ovarian tumor. He attempted to define this attachment by passing a long catheter into the bladder, but the tumor pressed so firmly against the pubes that it could not be introduced beyond that point. He now made an incision through the anterior wall of the bladder, and passing the index finger of the left hand, he was able for the first time to determine the upper limit of the adherent viscus, and succeeded in separating it from its extensive attachments. After this the tumor was removed in the usual way; its pedicle cut, ligated, and returned to the peritoneal cavity. With Peaslee's needle, he applied silver sutures to the abdominal wound, until the same was closed from above downwards to the opening in the bladder. He now passed the needle through

the abdominal wall; then through one vesical wall, through the other, and, lastly, through the opposite abdominal wall, and so continued to do, until the whole opening in the bladder was traversed by sutures. The sutures were then twisted, care being taken to lift the bladder well up to the surface, and the operation was completed. A Sims' sigmoid catheter was kept in the bladder. The sutures were removed on the tenth day, and the case progressed favorably until the fourteenth day, when a slight oozing of urine was discovered from an opening not larger than a cambric needle in the line of the incision; but this minute opening was closed by the application of an additional suture, and at the end of three months, the patient went home entirely well.

If after epicystotomy the drainage of the bladder is to be secured by the retention of a catheter per urethram, the method suggested by Chiene, of Edinburgh, for the cure of obstinate urinary fistulæ—the value of which I have recently had opportunity to verify—commends itself for adoption also after supra-pubic cystotomy. It is as follows: A flexible, perfectly smooth-eyed catheter is introduced and fixed to the penis with sticking-plaster. Care is taken that the eye of the instrument is just within the neck of the bladder. To this catheter an India-rubber tube is fixed, of sufficient length to reach, without being strained, over the side of the bed to the floor. It then passes into a bottle. The bottle and tube are filled with carbolized water before attaching the apparatus to the catheter. Care is taken that no air can get in at any of the joints. It is well to introduce a piece of glass-tubing at a convenient part for observing the direction of the flow. In order to keep the India-rubber tube steady in the bottle, a piece of glass-tubing is attached to its extremity. If the glass tube extends beyond the neck of the bottle, any folding of the India-rubber tube at this point will be prevented. A siphon action is in this way established, with a suction

power, the strength of which depends on the height of the column of water, and which will draw the urine into the eye of the catheter as it passes drop by drop from the openings of the ureters into the bladder, and a constant slow current of water will pass along the tube into the bottle. The bottle is allowed to overflow into a basin, which as it fills can be emptied without displacing the apparatus. The bladder is kept constantly empty. Care must be taken not to have too great a fall, or the suction of a piece of mucous membrane into the eye of the catheter will cause uneasiness and plug the catheter. The height of the hospital bed is generally sufficient, and in some cases even a less height is all that is required.

Palliative Treatment.

With regard to the treatment of malignant tumors, there is no reason why a timely operation may not, in certain cases, prolong life; but, as a rule, cancerous tumors will admit at most of but palliative treatment, such as alleviation of pain, controlling hemorrhage, and making life as endurable as possible. Pain, irritation, and spasm should be allayed as completely as possible by the *free* administration of anodynes, as by so doing we not only afford the necessary relief from suffering, but keeping both mind and body in a condition of quiet and rest, we diminish greatly the tendency to hemorrhage. Conditions that tend to the determination of blood to the pelvic organs should be avoided, the patient should lie with the pelvis somewhat elevated and the bowels must be kept free. As to the efficacy of ergot, gallic acid, turpentine, iron, sulphuric acid, matico, alum, etc., in restraining hemorrhage from tumors of the bladder, we are not enthusiastic; they seem to have occasionally served their purpose, but they must always be administered freely, and even then they will often disappoint. Local astringents and styptics are of much more value. Cold-water irrigation, ice-bags applied to

the hypogastrium or perinæum, or ice introduced into the rectum or vagina is often of much service. The topical application of sol. zinci chloridi, argent. nitrate, iron, alum, etc., have proved of marked success in checking hemorrhage. In injecting the bladder, it must always be remembered that the greatest care is to be taken during catheterization to avoid touching or bruising the tumor with the instrument, which always provokes more or less hemorrhage, and may thwart the very object it is sought to attain. In the introduction of the instrument, the eye of the catheter should reach just within the vesical orifice and no further.

In some cases, the bladder may be more advantageously injected by means of a fountain syringe or rubber-bag syringe without the aid of a catheter, and simply by hydrostatic pressure, as recommended by Zeissl. The patient is placed in the recumbent posture, with nates raised; the penis is brought up against the abdominal wall without undue stretching; the nozzle of the irrigator is introduced into the urethra and there held in such a manner that regurgitation of fluid from the meatus cannot take place; the stopcock is opened and the urethra becomes distended; the sphincters yield, and the fluid enters the bladder. Hunter McGuire, Professor of Surgery in Virginia, mentions a case of malignant vascular tumor of the bladder, where the soft gum catheter gave rise to serious bleeding and to severe urethral fever. Nothing gave the patient so much comfort as the use of this rubber-bag syringe. He not only employed it morning and night to wash out the bladder of the blood, mucus and pus that collected there; but sometimes an injection of simple warm water stopped the pain and vesical tenesmus better than anything else. Several times the bleeding was stopped by adding alum to the water. I have myself practised this method of injecting the bladder in many cases during the past few years, and often with much less pain and discomfort to the patient than when the catheter was used.

Conclusions.

From the foregoing observations and statistics I think we may formulate our conclusions as follows:

1st. In a few remarkable instances in the case of women, apparent recovery seems to have resulted from a spontaneous expulsion of growths from the bladder. But in general it may be said that tumors of the bladder, if uninterfered with, are inevitably fatal. And, although they may exist for several years without creating much distress, a fatal termination almost invariably ensues in a few weeks or months from the outbreak of active symptoms.

2d. Death results most frequently from hemorrhage, and from the effects of mechanical obstruction to the outflow of urine. Hence the indication would be to remove the growth while the general condition of the patient is yet favorable for an operation; before the subject has become exhausted from loss of blood, or the kidneys and bladder have become so much diseased as to make recovery impossible, even in the event of the successful extirpation of the growth.

3d. In women, because of the accessibility of the bladder to direct exploration, there is no excuse for temporizing, and the surgeon should lose no time in acquiring an exact knowledge as to the existence, nature, etc., of the tumor, and, if practicable, attempt its removal as early as possible.

4th. The results thus far attained by surgical interference, in the cases of women, could scarcely be more satisfactory, and excepting one instance in which the bladder was accidentally perforated, it does not appear that the fatal termination was precipitated by the operation in any of the cases.

5th. In the male, the propriety of operative interference must necessarily always be a more serious question; because of the occasional uncertainty of diagnosis, and because

of the gravity of the undertaking necessary for the removal of the growth. Nevertheless the results, thus far attained by operation, are most encouraging and in every way justify a repetition of the same.

6th. From a number of autopsies made, we learn that the successful operations might have been multiplied first in those cases in which no operation was attempted, although the growths could have been easily removed and with apparently every prospect of success; and again in those in which the operation was too long deferred and which, it is reasonable to assume, would have terminated successfully, had the same been undertaken at an earlier period.

7th. Given a positive diagnosis of tumor, the absence of severe secondary symptoms should be no excuse for deferring the operation. On the contrary, the earlier the growth is removed the better the prospects of complete recovery. With a healthy bladder and kidney, cystotomy is not so dangerous an operation as to warrant any delay.

8th. Evidence strongly pointing to the existence of a tumor with severe catarrhal symptoms or with spasm of the bladder and much suffering, will often justify an operation; for, if a tumor is found, its extirpation will afford the only chance for life; and if no growth exists, or the bladder is occupied by an irremovable cancer, the cystotomy may at least afford temporary relief from suffering.